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## Putting the Squeeze On Those Humongous Graphics Files

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APRIL 28, 1992 THE INDEPENDENT GUIDE TO PERSONAL COMPUTING VOLUME 11 NUMBER 8

# WINDOWS 3.1

- Everything You Need to Know to Upgrade
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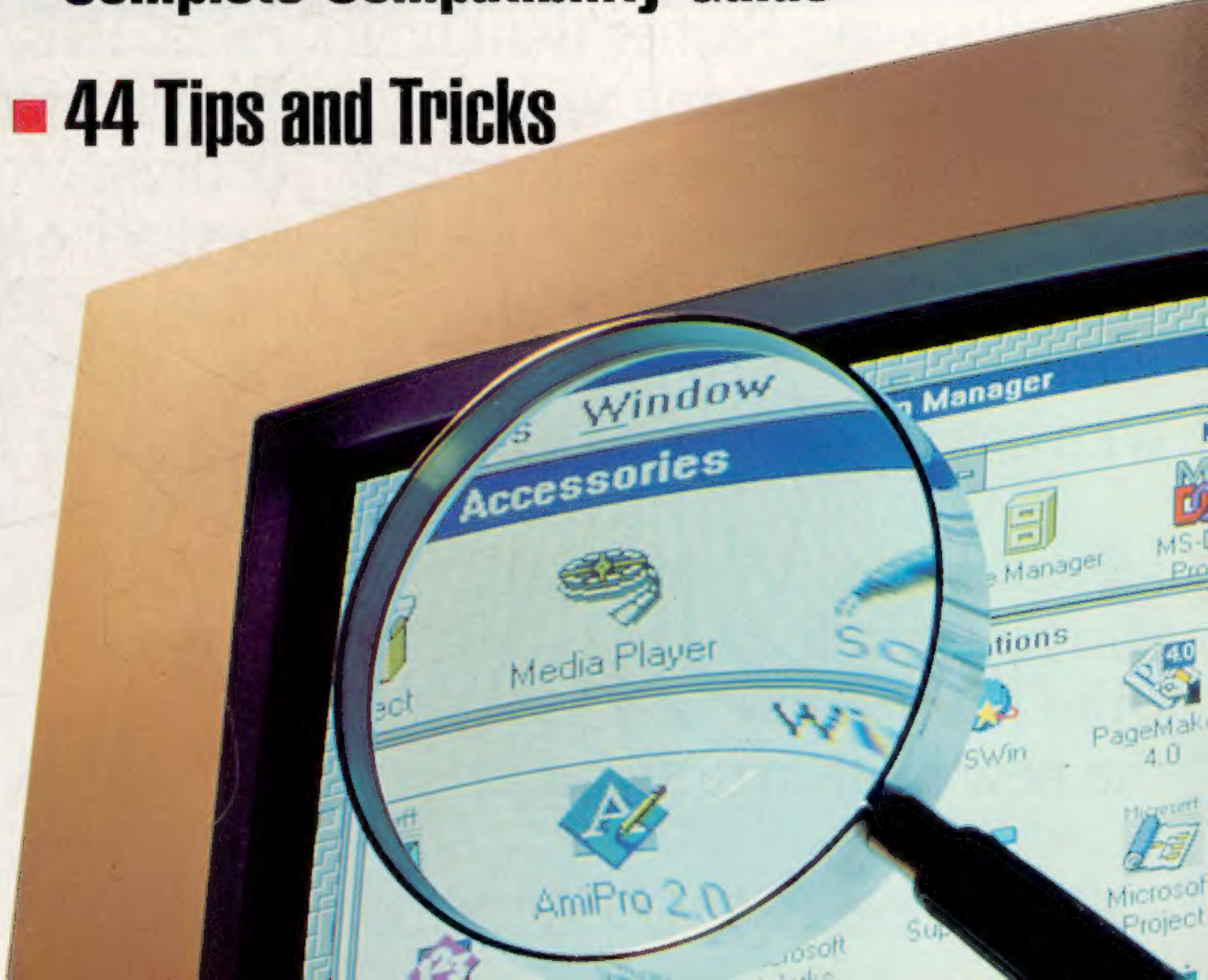
- Complete Compatibility Guide
- 44 Tips and Tricks

# OS/2 2.0

## Terrific Technology, But Can It Compete?



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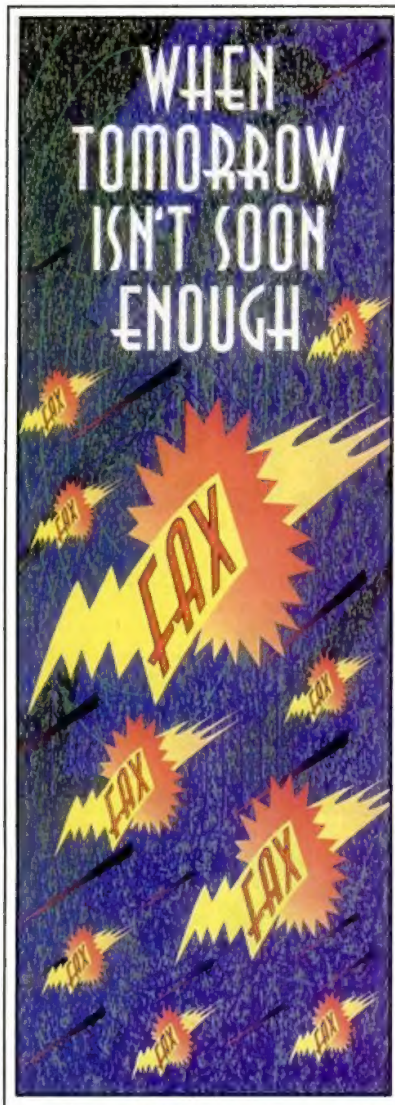


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# Inside

One holds an endowed chair of math and physics at Caltech. Another is the leading expert on W.H. Auden. Two are much-in-demand advisers to Fortune 500 corporations that are rethinking their core computing strategies. A fifth is the industry's most respected author of books and articles on programming for graphical environments. These are just 5 of *PC Magazine*'s 22 contributing editors: Barry Simon, Edward Mendelson, Jim Seymour, William F. Zachmann, and Charles Petzold.

Contributing editors are not full-time staff but experts who share their knowledge with our readers through columns, articles, and reviews. Most live in and around New York City, for easy commuting access to our product-testing facility, PC Magazine Labs. Those are the names you see above many of our product reviews: Alfred Poor, M. David Stone, and Bruce Brown, for instance. Others take advantage of the global network of electronic-mail services that allows them to live and write anywhere. Thus we have contributing editors in the Rust Belt (Winn L. Rosch in Ohio) and the Pacific Rain Forest (Michael Mefford and Craig Stinson in Oregon).

**Seven of our contributing editors: Joe Salemi, Bruce Brown, Mitt Jones, Alfred Poor, Edward Mendelson, Luisa Simone, and Charles Petzold.**

We believe this is the most talented team of individuals ever assembled by a technology magazine. They are to computer journalism what the 1927 Yankees were to baseball. And their accomplishments outside the computer industry are equally as significant. Our roster includes a neonatologist (Ray Duncan), a nonpracticing lawyer (Rosch), and more than half a dozen full- and part-time college faculty members. The vast majority came by their skills through hands-on experience rather than college computer courses, and that includes the authors of our back-of-book technical columns and utilities (Mefford, Duncan, Petzold, Neil Rubenking, Ethan Winer). They've written 88 books and technical monographs, ranging from the best-selling *Heart Attack Survival Guide* (Seymour) to mainstream computer books (virtually everyone) to *The Statistical Mechanics of Lattice Gases* (Simon). And they have anywhere from one to eight computers at home (Poor and Seymour, respectively). Contributing editors also serve as an editorial sounding board for *PC Magazine,* and they are involved in screening products for our year-end Awards for Technical Excellence and Editors' Personal Best.

With this issue we're happy to announce a new contributing editor: Joe Salemi, an expert on communications, OS/2, and networking, and the author of our Advisor column. A complete list of contributing editors appears on our masthead page.—**Bill Howard** ■

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PHOTOGRAPHY: THOM O'CONNOR

SEE YOU AT THE SHOW, BOOTH W1916, COMDEX.

# Great News For All Window Shoppers.

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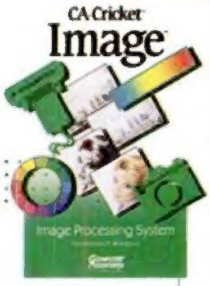

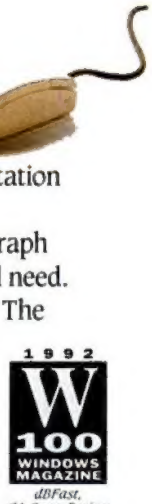


*dBFast, CA SuperProject and CA Compete! are the three winners of Windows Magazine's "Win Award".*

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# IN A CATEGORY OBSE AND LIGHTER, COMPAQ W ANOTHER ADJE

Make it smaller. Make it lighter. Make it lighter. Make it smaller.

These must be the mandates emblazoned upon every R&D document handed to the engineers of today's crop of notebook computers.

Admirable goals to be sure. Goals that the engineers at Compaq, however, believe fall well short of making the most of portable computing.

*Accurate to within minutes, the COMPAQ Power Smart Pack battery gauge clearly displays remaining battery life at the touch of a button.*

Which explains why the latest 386SL notebook technology from the labs in Houston — the new COMPAQ LTE Lite/25 and LTE Lite/20 PCs — are not only the lightest (a scant 6 lbs.) and the smallest (only 8.5"x11"x1.75") notebook PCs that we've ever built. They're also the smartest.

*The COMPAQ Hibernation feature saves all open files to the hard drive and turns the unit off, either upon request or as an automatic feature. Power up the COMPAQ LTE Lite later and you're back exactly where you left off.*

THE BRAINS BEHIND THE OPERATION.

When it came time to design a new notebook, we started (logically enough) with the battery.

The new COMPAQ Power Smart Pack battery in our new notebooks delivers up to 4.5 hours of computing, a full hour longer than most.

A microprocessor inside the battery itself monitors current usage levels and continually calculates the available power remaining.

It can even instruct the notebook to save all open files to the hard drive should the battery power run too low.

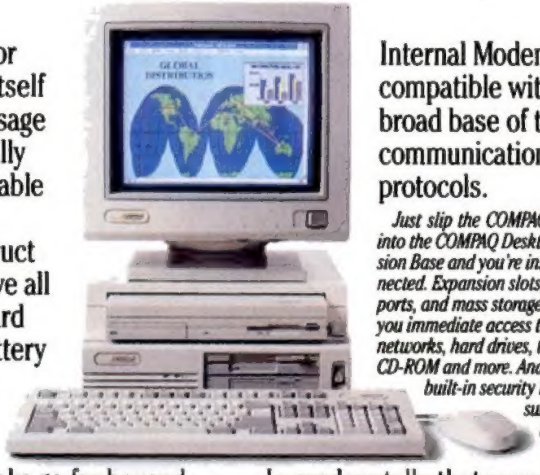
And the energy-saving features in our newest notebooks go far beyond the presence of an Intel 386SL chip.

To make the most of the smarter battery, the new COMPAQ LTE Lite also comes with user-adjustable power-drain settings, and three different sleep modes — System Idle, System Standby, and Hibernation.

A MOST MODERN MODEM.

Our optional 9600-bps modem for the COMPAQ LTE Lite PCs would make even Alexander Graham B. proud.

The COMPAQ Enhanced 9600-bps Internal Modem is compatible with the broad base of today's communications protocols.



*Just slip the COMPAQ LTE Lite into the COMPAQ Desktop Expansion Base and you're instantly connected. Expansion slots, external ports, and mass storage bays give you immediate access to monitors, networks, hard drives, tape drives, CD-ROM and more. And all the while, built-in security features ensure a safe harbor for your notebook.*

In modem talk, that means true V.32 9600-bps data transmission and V.42bis compression for up to 38.4 kbps throughput, as well as full support for Hayes AutoSync.

This little marvel negotiates the fastest transmission throughput that the other end of the line can muster, whether it's sending or receiving.

It even drops to a low power-drain standby state and monitors incoming signals if you're waiting for a call to come in.

Or for that matter, another modem to catch up.

NOT ONLY SMART, BUT BRIGHT.

The new, efficient COMPAQ Maxlight VGA display makes for a much brighter screen than our previous notebooks, and does it without sacrificing battery life.

Sharper graphics and text in up

*COMPAQ LTE Lite/25 only. © 1992 Compaq Computer Corporation. All rights reserved. COMPAQ, LTE Registered U.S. Patent and Trademark Office. Maxlight and Power Smart are trademarks of Compaq Computer Corporation. Trademarks and trade names shown are those of the respective companies. The Intel Inside Logo is a trademark of Intel Corporation.

# SSED WITH SMALLER OULD LIKE TO SUGGEST CTIVE: SMARTER.

to 64 shades of gray complement an enhanced video subsystem that's so fast it virtually eliminates "submarining," better known as "where did that #%$**# cursor go?"

A NOTEBOOK THAT'S USELESS IN THE WRONG HANDS.

At Compaq, we realize that data security is every bit as important as hardware security.

At the hardware level, DriveLock locks the hard drive, preventing access to data even if the drive is removed.

One-touch QuickLock and QuickBlank functions

*Isolated inverted "T" cursor controls are in a familiar position so you don't have to teach your fingers new tricks.*

allow you to quickly (surprise) disable the keyboard or blank the screen.

And of course, our new notebooks come with a Keylock slot for an optional cable lock.

With all of the above, plus a 120-MB hard drive,* RAM expansion to 10 MB, cache memory, simultaneous display, and an auxiliary battery, to say these are the best notebooks we've ever made would be something of an understatement.

To back them with a one-year worldwide warranty and our toll-free Compaq Customer Support Center hotline would be more like it.

So don't choose between a small notebook and a smart notebook. Choose both.

Choose the new COMPAQ LTE Lite. For information about our new notebooks or an Authorized COMPAQ Reseller near you, call Compaq in the U.S. at 1-800-231-0900, Ext. 100, or in Canada at 1-800-263-5868, Ext. 100.

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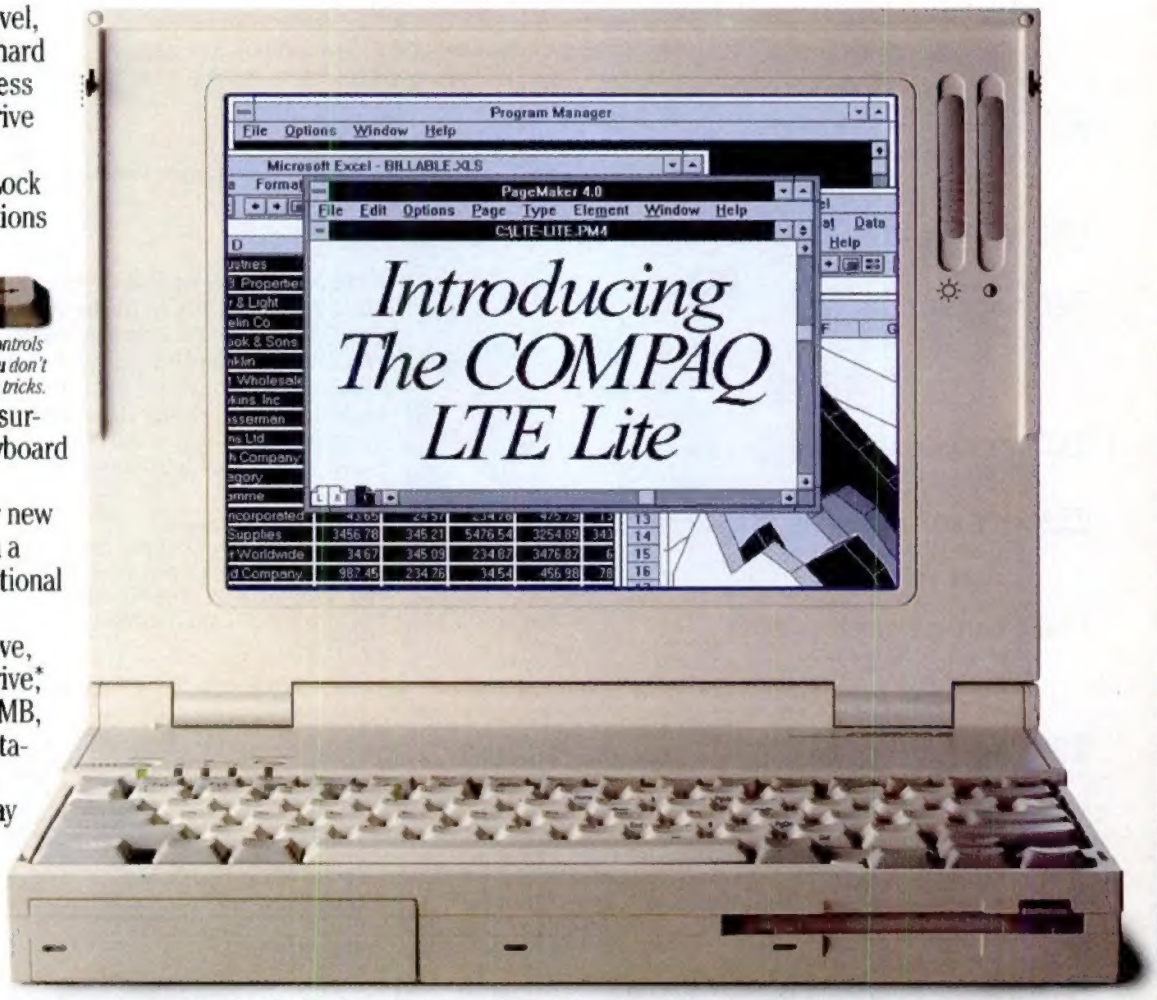


*Actual weight: 6 lbs. Actual dimensions: 8.5" x 11" x 1.75". Actually, this is the best notebook we've ever built.*

CIRCLE 137 ON READER SERVICE CARD

PC MAGAZINE®

# April 28, 1992

*Volume 11 Number 8*

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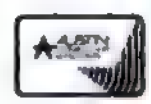

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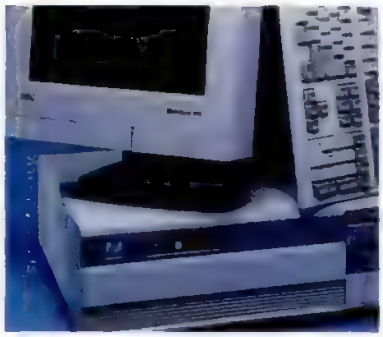

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# Letters

**DISK UTILITY DISAGREEMENT**

Are we being brainwashed, or what? I refer to your feature on disk utilities ("Disk Utilities: First Protect, Then Enhance," January 28, 1992), in which you use a Windows metaphor to report Suitability to Task even though only one of the three programs reviewed is a Windows application! Would you please consider publishing a spin-off magazine in which you could exercise some of your unbridled enthusiasm for Windows while restoring some perspective in *PC Magazine*? Or are you totally committed to mesmerizing all PC users and dropping them over that cliff icon?

Bruce Miller
Derby Line, Vermont

Edward Mendelson's disk utilities article should have included DR DOS 6.0 and not just MS-DOS 5.0. DR DOS is a major product (sixth best on your Ingram-Micro Top 15 list, Trends, January 28, 1992) that supports several of the features covered. Not only does DR DOS 6.0 offer DELWATCH, DISKMAP, RECOVER, UNDELETE, and UNFORMAT, it also has DISKOPT—a disk optimizer that MS-DOS 5.0 lacks. How do these programs compare with *The Norton Utilities, PC Tools,* and MS-DOS? Even if they are essentially the same, you should let us know.

Ken Rihanek
Omaha, Nebraska

Your review of disk utilities notes that ". . .Fifth Generation Systems' *Mace Utilities*. . . was not reviewed because a new version is still in the planning stage." Does this mean that Symantec and Central Point do not have new versions in the planning stage?

Arthur David Olson
Silver Spring, Maryland

PC MAGAZINE Fifth Generation Systems specifically asked that its soon-to-be-obsolete version of *Mace Utilities* not be evaluated for that feature, so we agreed to leave the program out.—*Ed.*

**Readers are divided over our disk utilities feature.**

**WHAT DO PEOPLE REALLY NEED IN A NOTEBOOK?**

I was happy to see the columns (February 11, 1992) by Dvorak and Seymour about what makes a good notebook computer. I especially like the comment in Seymour's column about the Sharp PC-6220 class of 286 notebooks.

Though these machines are discontinued, 286 class, and dirt cheap compared with 386SX notebooks, Seymour states that he, Dvorak, and Machrone still "rely" on them, even though they can have whatever they want. I find it hard to believe that he admits actually using anything with the lowly 286 microprocessor.

What it does prove is that there is always the right tool for the right job. Currently, the notebook computer is not meant to be a replacement for your desktop machine. Some people may use it as such, but most of us use a notebook to increase our productivity in what would normally be wasted time.

I own a Sharp PC-6220. I agonized about buying a lowly 286. But the price was too good to resist, even with dropping 386SX prices. It is the best computer money that I ever spent. Unless your only computer is going to be a notebook, do not be afraid to buy a very portable, true-notebook-size 286. My productivity has skyrocketed. The best part is that I saved $1,500 by not being enamored with the 386SX notebook hype. That money was spent on useful software and hardware that made me even more productive!

Tim Merrill
Gainesville, Florida

Both John C. Dvorak and Jim Seymour consider a floppy disk drive to be a weight-adding nuisance in a notebook. I guess it's all relative. For two years now, I've lugged my 25-pound PC Brand portable through airports too numerous to count. I bought that heavy machine because I need both 5.25- and 3.5-inch drives to transfer files to and from my clients' computers. *LapLink* is great if you use the same computers all the time, but installing it several times a week isn't my idea of convenience or economy.

If manufacturers want to make floppyless notebooks for Dvorak and Seymour, go for it. This is America, though—land of consumer choice. I hope the industry realizes there are bucks to be made by giving us diverse choices in our portable computer configurations.

John Nehring
Bozeman, Montana

**IBM WAS THE PROBLEM, NOT MS-DOS**

I'm tired of hearing statements like the one in "Nine Memory Managers Open Up New Frontiers" (February 11, 1992): "The designers of MS-DOS, Version 1.0, arbitrarily divided that first megabyte of memory into 640K RAM for the operating system and applications and 384K reserved for hardware."

As the sole designer of MS-DOS, Version 1.0, I did no such thing. In fact, the

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CIRCLE 325 ON READER SERVICE CARD

# Letters

first computer that ran DOS (made by Seattle Computer Products, not IBM) could have a full megabyte of memory for DOS and applications. The system ROM occupied only the last 2K of the address space, but even that could be switched out after bootup so that not 1 byte of the megabyte would be lost. (This required 512 16-kilobit RAM chips spread over 16 memory cards, but it could be done!)

Those of us who lived with the 64K address space of the 8080/Z80 had learned our lesson. IBM, unfortunately, did not. They alone decided to build memory-mapped hardware right into the middle of our precious address space. I am mystified as to why anyone would consider this poor hardware design to be an aspect of DOS. DOS uses as much contiguous memory as can be made available.

Tim Paterson
Redmond, Washington

### DATA COMPRESSION IS ANTI-WINDOWS

I was somewhat taken aback by what I read—or rather, by what I didn't read—in your hard disk story ("Double—No—Triple Your Hard Disk Space with On-the-Fly Data Compression Utilities," January 28, 1992). By not challenging (or at least qualifying) that "these products are a highly affordable, safe, and simple alternative to upgrading your hard disk," your editors really fell down on the job.

Data compression imposes a handicap on Windows users. Windows apps continually access the hard disk to load functions from DLLs. The best way to get even halfway decent speed on a 286 or a 386SX machine is to add RAM and a disk cache program. Compression utilities are incompatible with caches, and they slow down direct disk access—a double whammy that renders a 286 or a 386SX utterly useless for Windows!

What other incompatibilities lurk in the mire? FASTOPEN? Quite likely, and if so, another cause of system slowdown. Virus protection software? These are major real-world issues, and they should have been addressed. After all, they affect people's habits and procedures—not to mention their level of confidence. In short, the review was a letdown from your normal level of professionalism.

Maloney
Spokane, Washington

### ASTROLOGY HATERS CLUB

I realize that *PC Magazine* is not *Scientific American* and so you are not under the same pressure to maintain scientific integrity. You have a perfect right to print reviews of any software you want, including astrology software (After Hours, February 11, 1992).

Still, I'm curious: If someone had developed a slick commercial package that would make statements about a person's character, compatibility, and everyday affairs based on race, religion, and sex (instead of the date and time of birth), would you have published a similar review and referred to the product as "fun and informative?"

David Murdock
Cookeville, Tennessee

Was Karen A. Carter's review of the two astrology packages a joke? Astrology certainly is. As I read the reviews it began to dawn on me that Carter actually thought this junk was worthwhile. The research that has totally debunked the efficacy and theory of astrology would easily fill a CD-ROM disk. Yet the disciples of this balderdash continue to whine about a lack of open-mindedness when one accepts the truth that it simply, flat-out doesn't work.

Astrology software is the finest example of GIGO (garbage in, garbage out) in the computer world. The graphs are stunning on a VGA, the printouts look as if they are expressing valid opinions about life, and the terminology uses words from science devoid of their operational definitions. But astrology has contributed absolutely nothing of value to the real world.

What's next? How about going gaga over communications software for communicating with all those UFOs buzzing drunken farmers in swampland?

Terry Sandbek
Fair Oaks, California

### THE DENTIST STRIKES BACK

I was dismayed to read Matthew J. Ross's review on the *WinSpeed* display driver (First Looks, January 28, 1992), in which he characterized the buying of a new graphics board as the equivalent of "a visit to the dentist—painful and expensive." I had thought that a magazine trying to be on the cutting edge of technology would not let such old stereotypes creep into reviews. Modern dentistry with the latest technology is no longer painful or expensive.

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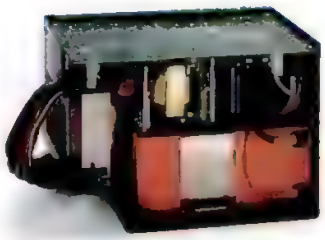

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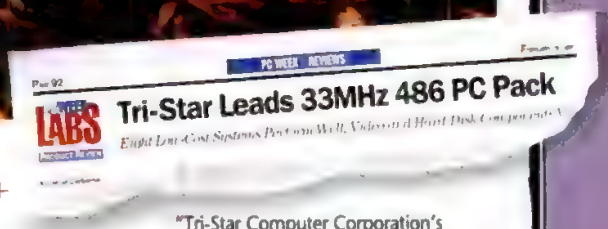


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CIRCLE 344 ON READER SERVICE CARD

never backing up a 200MB hard disk, can be an uncomfortable and costly experience. Hopefully you can find better metaphors in the future that don't scare people away from needed care.

Stephen Alsobrook, D.D.S.
Memphis, Tennessee

**KEYBOARD CRISIS**

As I was purging a recent issue of your magazine of card-stock advertisements, I came across a tantalizing picture of an ergonomic keyboard (January 14, 1992, page 186). The keyboard was identified as a Maltron, but no further information was given about that keyboard or about other ergonomic keyboard manufacturers. Can you help?

James L. Weston
Cottondale, Alabama

PC MAGAZINE In our February 25, 1992, issue we ran a feature called "Replacement Keyboards: The Write Stuff." The PCD Maltron Ergonomic Keyboard was reviewed in the sidebar "Healthier Typing with Keyboard Enhancements." It costs $637, and you can order it by contacting Applied Learning Corp., 1376 Glen Hardie Rd., Wayne, PA 19087; 215-688-6866.—*Ed.*

**THUMBS UP, NOT DOWN!**

Jim Seymour incorrectly stated in his "Thumbs Down, Why Bother Award" (January 14, 1992) that Microsoft was "endlessly hyping the TrueImage page-description language, signing up printer makers to produce TrueImage machines—then handing the administration of the thing over to LaserMaster, a printer maker and thus competitor to all the other licensees involved."

Microsoft has never announced that it has discontinued support for TrueImage. In fact, a July 1991 press release stated Microsoft's continuing support of the product and the release of Version 1.1 of the code. The same press release announced that Microsoft had started a Mentor program that would empower authorized third parties to port TrueImage to various platforms for OEMs and license "object code" of TrueImage to these customers.

Microsoft was inaccurately described by your magazine (November 26, 1991) as having "dealt off TrueImage (and its TrueImage licensees) to LaserMaster, which will continue, in theory, to help develop TrueImage products." LaserMaster is indeed one of our three Mentor developers. But LaserMaster does not have any administrative or development relationship with any of the existing TrueImage licensees or with any new OEM customers who license the code directly from Microsoft. Microsoft will continue to maintain and enhance the TrueImage core code.

Keith Amodt
TrueImage Product Manager,
Windows Printing Group
Redmond, Washington

**WASTED WORDS**

Why don't you give The Working Word more pages? If you say that space is limited, you can always cut down on your regular columnists. They are beginning to get tired. Compare the number of hate letters John C. Dvorak has received in the latest issues with what he used to receive.

Per Tangerud
Lier, Norway

**SCANMAN ADVICE**

Jim Nollman's problem (Letters, February 11, 1992) with Logitech's Ansel and an older ScanMan model differs from my experience. Ansel's UPGRADE.TXT file explained a method for selecting among IRQs 2, 3, 4, 5, or 7, depending on the PC's type and configuration. ScanMan's SETSCAN program showed the physical layout of the IRQ jumper pins on the ScanMan interface board.

I placed the jumper block (provided with ScanMan but not then used) over the pins for my selection, IRQ 5, and everything worked fine. If Mr. Nollman has used all IRQs available to ScanMan, he could reassign IRQs for other accessories. For instance, 16-bit boards might be capable of using IRQs higher than 7.

Donald Wechsler
Houston, Texas

**HOW TO WRITE TO PC MAGAZINE**

We welcome your comments, complaints, insights, and suggestions. Please send them to Letters, *PC Magazine*, One Park Avenue, New York, NY 10016, or upload them to PC MagNet (see page 10 for access information). All letters become the property of *PC Magazine* and are subject to editing. ■

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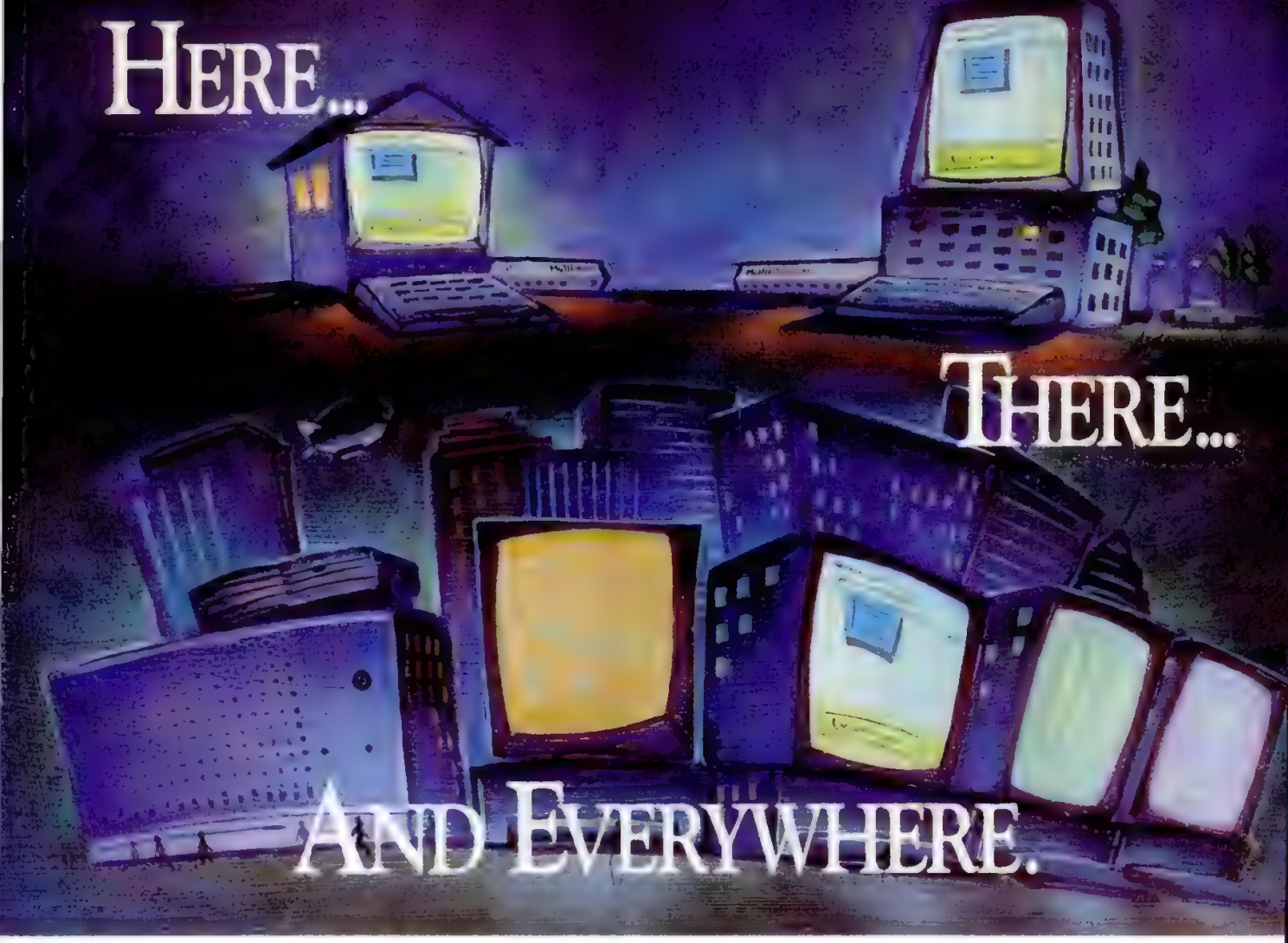


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CIRCLE 108 ON READER SERVICE CARD

# Trends

*Trends & Technology Shaping the Personal Computer Market*

## Pen Computers: One in the Hand Worth Two in the Press

After months of ink in the trade press, pen computers are finally getting into the hands of consumers (see First Looks). But manufacturers are still grappling with obstacles and drawing up battle lines that could keep pen computers from becoming mass-market products.

Pen computers, which use a pen and paper metaphor, have operating systems that use handwriting recognition to let you enter data by writing on the screen. You interact with the programs by using pen movements called gestures. With virtually no learning curve, manufacturers feel that pen computers will coax millions of new users into the computer market.

The reality, though, is that the best recognition software can recognize only about 98 percent of hand-printed characters, which snowballs into a staggering 10 percent miss rate on words. And recognition of cursive script, which is the way most people write, is further away.

Pen advocates argue that much of the work done on these computers will be checklist-type notations, or note-taking that's meaningful in its scribbled vector or bitmapped image form. (See related story, this page.)

While it's still early, there also doesn't seem to be one "killer app" to lure users to the pen platform the way *VisiCalc* propelled Apple II computers or *Lotus 1-2-3* sold IBM PCs. Two promising pen-centric applications (which means they don't require a keyboard), from Slate Corp., are the *At-Hand* spread-

CONTINUES ON PAGE 32

**Pen computers use a pen and a digitizer and come in four sizes.**

**Hand-held**
Shaped like a long steno pad; uses a proprietary operating system. Examples: PoqetPad, GRiD PalmPad.

**Clipboard**
Just like a hand-held pen computer, only bigger. Example: GRiDPad/RC.

**Tablet**
Does not have a keyboard; runs either GO Corp.'s PenPoint or Microsoft Windows for Pen Computing. Examples: NCR 3125, Datellite 300.

**Pentop**
Shaped like a tablet but with both a keyboard and a stylus. Example: Momenta.

## What You Write Is What You Get

Don't expect everything you write on a pen-based PC to be translated into computer-readable text. Many pen-centric applications will treat the screen as electronic paper and your scribbling as electronic ink.

The new buzzwords are "ink as a data type." Most of what you write on your pen computer will be stored as vector-based graphics. "Ink" saves stroke information such as the pen's starting and ending points, direction, velocity, the pressure of the pen, and the color of the ink. Saving your writing as vector information, which is a series of *x*, *y* coordinates, allows it to be scaled, keeps it device independent, and lets the application judge which information to use.

Programs that use handwriting recognition need to know the stroke order to be able to differentiate, for instance, between a 5 and an S. Stroke order tells the recognition software that a 5 has two strokes but that an S has only one. Future signature-verification programs will demand stroke order, velocity, and pressure information in order to authenticate a signature.

Not every application will need that much information. Some may simply rasterize the ink into a bitmap to keep the size of the file as small as possible. Like other graphics files, Ink is stored in a compressed format.

*Day-Timer Pen Scheduler* uses electronic ink for note taking; handwriting recognition is only for names and addresses. Instead of wasting CPU time and power to translate scribbles into ASCII, it stores them as Ink. The program assumes you're the only one who will read these notes and that the way you write them (at the bottom of the page, in the margin, or in a circle) has meaning for you. It cleverly lets you attach index categories to the scribbles so you can retrieve them in their original form and lets you drag and drop them from one day of the appointment book to another.

Pensoft's *Perspective* uses Ink in different ways, depending upon your needs. Its InkWell feature captures notes that can be saved as Ink or recognized as text at a more convenient time. Or you can save your doodles as a drawing with no character recognition. *Perspective* is built on a database. After recognition it looks for other associations, and the text is dynamically cross-referenced to an index.

—*Christopher Barr*

## Glimpsing Win's Future: WOSA, Cairo

Microsoft has been giving sneak previews of the future of Windows for some time. Now the company has outlined two key pieces of the bigger picture: Windows Open Services Architecture (WOSA), which is ready to go, and Cairo (an internal project), still over the object-oriented horizon.

WOSA is the framework for anything that provides the desk-

# Pipeline

by Gus Venditto

## Don't File Your Tax Software Yet

If you've been using a tax program this year, you're probably looking forward to filing away the manual and freeing up those extra megabytes on your hard disk.

That may not be such a good idea.

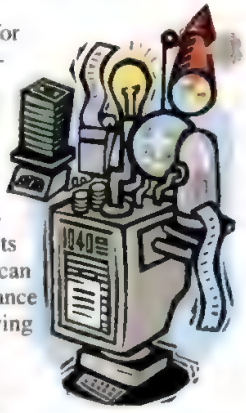
Experts will tell you that it's a big mistake to wait for the end of a tax year before you start looking for safe tax havens.

Back when tax software was little more than a fancy calculator that printed IRS-approved forms, tax programs had little value after your 1040 was in the mail.

When tax planning and what-if features were added, the tools were crude; they were little more than ways to fiddle with last year's return.

Like every aspect of tax software, the options for planning have gotten better. As a result, you'll find that it's well worth your time to get your tax software working in tandem with other financial tools.

For example, ChipSoft and Intuit have built a bridge between *TurboTax* and *Quicken*. If you format your *Quicken* accounts properly, *TurboTax* will build a return using actual numbers. That can do more than cut down on input time next year. It can be used to monitor changes in your financial situation.




As *Quicken* continues to add features for tracking all types of investments and spending, the value of your tax-to-checkbook link can only go up. Still, there's a limit to how much help you'll get. If you're buying a mutual fund, it will be up to you to project the capital gain and to format it correctly.

If you're using *TurboTax*'s rival, Andrew Tobias's *TaxCut 1040*, along with its companion, *Managing Your Money*, you can get advice on a wider range of personal finance choices: buying or selling real estate, saving for a child's education, taking out a loan.

You get tax advice and, in some cases, guidelines to expected returns on investments as you enter them. You can import the *Managing Your Money* numbers into *TaxCut 1040* for a "mid-year" return, but you don't need to. *Managing Your Money* has its own built-in tax estimator, showing only the numbers that really matter.

It's clear that, in coming years, you'll be better equipped for tax time if you choose the product that works in step with your other financial planning tools. *Quicken* is the most widely supported of the financial management programs, with *Dollars & Sense* and *Microsoft Money* close behind.

If the idea of being ready for next year's taxes appeals to you, don't wait to get started. Tax programs expect your data to be properly formatted, and you may need to make extensive changes in your *Quicken* or *Microsoft Money* accounts.

Of course, no tax program can account for changes that Congress will make in the tax code between now and the end of the year—especially not in an election year.

*Gus Venditto is a contributing editor to* PC Magazine *and the editor of* PC Sources.

top with services (such as connecting to a database server or managing a site license), but it does so in a way that is independent of the underlying technology. So OLE (object linking and embedding), MAPI (mail application program interface), Macro Manager, and the Open Database Connectivity initiative are all pieces of the strategy.

WOSA works like a super device driver, enabling all sorts of applications to share services and freeing the user from having to think about who developed them or where they are. Microsoft is promising a standard set of APIs that developers can use to access these services. The company is also promising an SPI (Service Provider Interface) so third-party service providers can take advantage of their specific environments.

The services strategy addresses the issues that make connecting to heterogeneous environments a headache for Windows developers and users: database access, security, messaging, distributed file and print services, systems management, and host connectivity.

Some of these services, such as global directory, are being developed by the Cairo project in Microsoft's Advanced Systems group. Poised to go head-to-head against Taligent (the newly formed IBM/Apple venture), Cairo represents the vision for a new object-oriented operating system—an environment that is sure to change the way we do our data and file management. Central to Cairo is the notion that you should be able to find data anywhere on the networks, wherever it resides, without having to remember details as mundane as filename, location, or platform.

From an end-user perspective, the benefits are that Cairo will let users find data or use a printer that he knows is "out there on the network." Cairo probably won't be fully realized until 1994, but parts of it—such as the improved program-to-program communications (Remote Procedure Call) and the new user-interface shell—are expected to appear along the way.

*—Mary Kathleen Flynn and Robin Raskin*

## At Last, SCSI Gets Plug-and-Play Products

Products that promise to work with all SCSI devices are making their debut, lending credibility to vendors' claims that the SCSI interface will soar in popularity this year. Corel Systems Corp. is pledging to support every SCSI device on the market with its new interface kits, and Pacific Micro Data says its new disk array subsystem is the first to use off-the-shelf hard disks from multiple vendors.

SCSI (which stands for small computer system interface and is pronounced *scuzzy*) offers advantages over other interfaces: It's 20 percent faster than the IDE interface and twice as fast as ESDI, and it can handle up to seven peripherals. SCSI is a natural choice for file servers, and, as users add scanners and CD-ROM drives to their systems, SCSI makes sense on the desktop.

So why doesn't SCSI reign supreme on the PC as it does on the Mac? Mostly because there hasn't been a standard SCSI implementation on the PC. Products from one vendor won't work with products from another. And because DOS and Windows don't recognize the interface, getting a SCSI device to work at all—even when you've got the right drivers—isn't easy.

Corel hopes to solve these problems with new interface kits called CorelSCSI. Better known for *CorelDRAW* than for SCSI adapters, Corel does have expertise in developing SCSI software: 75 percent of all WORM devices are sold with its drivers.

**SCSI Host Adapter Market Leaders**

1. IBM
2. ADAPTEC
3. FUTURE DOMAIN

IBM, which includes the SCSI interface with several PS/2 models and offers it as an option with others, sells more SCSI adapters than anyone else. But in after-market sales, Adaptec is the leader with a 70 percent share.

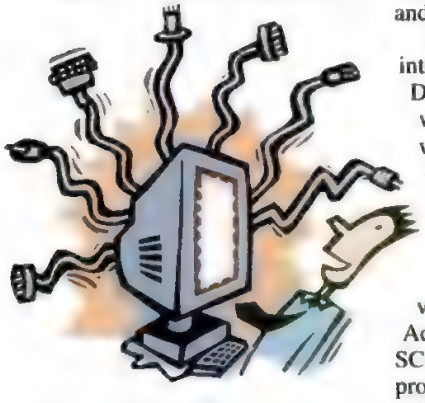
Source: Technology Forums (Lino Lakes, Minn.), Adaptec

CorelSCSI provides drivers for the whole range of peripherals: hard disks, tape drives, optical drives and jukeboxes, CD-ROMs, scanners, and Flopticals.

With CorelSCSI, the company goes up against market leader Adaptec, which makes adapters it says will work with any peripheral that adheres to the SCSI spec. But many of the drivers for Adaptec's products are written by third parties, and Adaptec doesn't guarantee them.

Also in Corel's favor are its prices: The $325 16-bit kit includes a bus-mastering adapter based on NCR's chip set, drivers, plus tape backup software. Adaptec's closest offering costs $516 and doesn't support scanners, jukeboxes, or Flopticals.

While Corel is targeting single users and network managers alike, Pacific Micro Data, based in Tustin, California, is



aiming at the file-server environment, where SCSI's speed is important. Disk array subsystems combine multiple disks into a large volume that appears as one logical drive, reducing the risk of losing data and allowing the file server to continue working even when a drive fails.

Most disk arrays require hard disks from the same vendor. Pacific Micro Data boasts that its MAST XII subsystem, which it sells to value-added resellers for approximately $10,000, will work with SCSI hard disks from Fujitsu, Maxtor, Micropolis, and Seagate, and host adapters from BusTek, DPT, and UltraStore.

True ease of use and interoperability may not be achieved until SCSI is built into the system board and operating system, but these new products are steps in the right direction.

*—Mary Kathleen Flynn*

## SCSI Protocol Wars: ASPI, CAM, LADDR

You can't just plug any SCSI peripheral into any SCSI adapter because there isn't a sure-fire way for them to talk to each other. What's missing is a standard driver protocol. Right now, three protocols are competing for the right to set the standard: one from Microsoft, one from ANSI, and one from Adaptec.

Each of the three protocols promises to make SCSI host adapters work smoothly with all SCSI peripherals—hard disks, scanners, printers, tape drives, CD-ROM drives—and each uses a similar approach. All three protocols use a layered design. But because they order commands differently, you can't mix and match them.

Two years ago, Microsoft introduced LADDR (Layered Device Driver Architecture), which the company hoped would provide a standard driver protocol for SCSI devices. And although OS/2 1.3 and Microsoft's *LAN Manager* 2.1 do indeed include LADDR, most SCSI vendors are writing to Adaptec's ASPI (Advanced SCSI Programming Interface) protocol— which is not surprising given that Adaptec is the dominant player in the adapter market.

However, Adaptec's competitors (such as rival chip set maker NCR and adapter vendor Future Domain) don't want Adaptec to run the show. They have persuaded the ANSI standards body and Apple to embrace a third standard called CAM (Common Access Method), which they say is more flexible than ASPI. ANSI expects to approve it shortly, which so far has done more to confuse the market than to help straighten it out.

Meanwhile, ASPI continues to gain momentum; many vendors already consider it the de facto standard without ANSI's stamp of approval. Developers like Corel, the market leader in WORM drivers, and Sytron, the leader in tape drive software, have licensed ASPI from Adaptec. And IBM recently commissioned the company to write an ASPI-like driver for OS/2 2.0. Finally, those in the ASPI camp say that current implementations of CAM don't work with each other.

*—Susan G. Thomas*

## Virtual Reality Goes Mainstream

Virtual reality, the creation of simulated worlds with computers, is more than a fancy way to play games. Gloves and head-mounted stereo displays may look like video arcade toys, but they may soon be the preferred method for looking at complex data. And while the first virtual reality systems required powerful minicomputers, the technology is working its way down to top-of-the-line PCs.

Virtual reality has been mythologized in novels and movies as science fiction. But virtual reality on a computer can also be a user interface that lets you view data in a new way. "Virtual reality is not magic, it's not a drug; it's a software technology," says Marc Le Brun, Director of Advanced Technology at Autodesk.

Autodesk, maker of *AutoCAD*, is developing a virtual reality parts kit to create virtual spaces. The C++ software is the first product to come out of the company's long-running cyberspace project. Le Brun says the first applications built with the tools will be CAD programs that let you experience an architectural structure, or allow scientists to "walk through" molecules. Other CAD programs in development will tackle product design, letting designers see, for example, if their designs really let a mechanic reach a part.

Education is another area where virtual reality can be used. Imagine putting your child in the middle of the Continental Congress to vote on the Declaration of Independence. It's a history lesson he or she wouldn't soon forget.

Headgear and gloves are not always required in a virtual reality system, but they can help pull you through the frame of the CRT and put you inside the action rather than have you view it in two dimensions, as if it were a play. Head-mounted displays put you inside a building or let you fly past a molecule or stroll through your data.

Real-time rendering makes powerful demands on a computer system's resources, and only high-end PCs can produce

**Top 15 Software Sellers at Retail**

| Last Issue | This Issue | Software |
|---|---|---|
| 1 | 1 | **Microsoft DOS 5.0 Upgrade Kit** Microsoft Corp. |
| 4 | 2 | **TurboTax Personal 1040** ChipSoft |
| 3 | 3 | **WordPerfect 5.1 for DOS** WordPerfect Corp. |
| 2 | 4 | **Quicken 5.0** Intuit |
| 5 | 5 | **QEMM-386 6.0** Quarterdeck Office Systems |
| 7 | 6 | **Stacker 2.0** Stac Electronics Inc. |
| 6 | 7 | **Microsoft Windows 3.0** Microsoft Corp. |
| — | 8 | **The Norton AntiVirus for Windows 2.0** Symantec |
| 9 | 9 | **ProComm Plus 2.0** Datastorm Technologies |
| 10 | 10 | **Lotus 1-2-3 2.3** Lotus Development Corp. |
| 13 | 11 | **The Norton Utilities 6.01** Symantec Corp. |
| 8 | 12 | **Quicken for Windows** Intuit |
| — | 13 | **QuickPay 2.0** Intuit |
| 11 | 14 | **DR DOS 6.0** Digital Research Inc. |
| — | 15 | **Fastback Plus** Fifth Generation Systems |

The list ranks PC business programs according to the total number of copies shipped to stores and resellers in the week ending February 22, 1992. The list is based on shipments to more than 12,000 retail locations. It does not include sales made directly by software publishers and can not be interpreted as a picture of the entire software market.

Sales information compiled by Ingram-Micro.

## BRIEFS

■ **New IBM Answers the Phone:** One year after Compaq began providing its customers with toll-free technical support, IBM is following suit. Customers can call IBM's HelpCenter in Atlanta with questions about PC hardware and software from 8:00 to 5:00 in "your time zone" (800-PS2-2227). HelpCenter is one of the programs in IBM's new HelpWare campaign, which is designed to give customers a more direct relationship with the company. Other programs include HelpLearn, a chain of educational centers throughout the country, and HelpBuy, which offers financing for purchases above $750.

■ **Keeping Secrets:** "Copyright laws don't protect ideas or methodologies, so it's important for companies to know that the trade secrets laws are there," says attorney Jane Stevens, who is representing Computer Associates (CA) against a former employee who, it says, was selling a product based on algorithms developed by CA. A federal judge has granted a preliminary injunction against the former employee. To take advantage of the trade secrets laws, companies must show they have guarded their secrets carefully. Stevens advises companies to do the following: Clearly identify the things it considers secret and make sure employees understand; require employees and third parties to sign confidentiality agreements; stamp as confidential all documents containing sensitive information; and use password security on all computers.

■ **File Shrinking:** General data compression software such as *PKZIP*, which uses a data dictionary method, typically makes your files five times smaller. But now WEB Technologies is taking a new approach. The company's algorithm manipulates data mathematically to deliver 16 to 1 compression and better, without compromising data integrity (404-514-8000).
—*Mary Kathleen Flynn*

**They may look silly, but head-mounted displays and gloves let you "walk through" the application.**

the horsepower needed to generate the graphics output. SENSE 8, of Sausalito, California, another virtual reality software toolkit vendor, recommends a fast 486 with a math coprocessor and a graphics accelerator as the minimum system. Alternate input and display devices such as gloves, headgear, a 3-D mouse, and stereo headphones can be added.

Virtual reality transforms data into things you can see, feel, and even touch. The implications for new insights and new perspectives are huge.
—*Christopher Barr*

## Flight Simulators Get More Real

Virtual reality may seem like a dream of the future, but PC simulations are already making an impact in aviation.

Beginning pilots must spend a lot of time and money learning to fly: time learning and practicing new skills, and money on airplane rentals and instructor fees. And student pilots add to the wear and tear on a dwindling supply of single-engine training airplanes.

For years, commercial airlines have used expensive simulators to train pilots of large jet aircrafts, but few private pilots can afford them. Recent advances in computer processing power, graphics resolution, and digitized sound, however, mean that desktop computers can provide fairly sophisticated simulations. About the only thing PC-based simulations can't do is actually move the way large-scale simulators do.

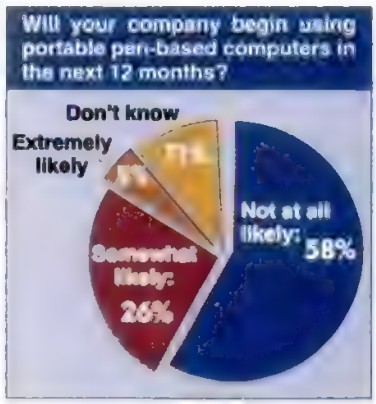
The best-known product of this type is Microsoft's *Flight Simulator*, which boasts more than 5 million users. More than just a game, *Flight Simulator* models the flying characteristics of real airplanes.

There are many other PC-based products that make flying a computer more like the real thing. Mallard Software's *Sound, Graphics, and Aircraft Upgrade* ($39.95), created by the Bruce Artwick Organization, adds high-resolution display support and digitized sound to *Flight Simulator* for enhanced realism (214-436-0044).

To learn to fly on instruments—a required skill for pilots who want to fly in cloudy weather—AzureSoft sells *ELITE* for $749 (800-282-6675) and Flight Deck Software sells *IFT-PRO* for $350 (800-955-4359). Novel Twist (407-254-6484) and Flight Link (916-891-4987) sell accessories such as sophisticated yokes, rudder pedals, and cockpit panels that provide a more lifelike experience than you get with a keyboard

The Federal Aviation Administration (FAA) is taking a serious look at the role PC-based flight simulation programs might play in pilot training programs. The FAA has plans to classify flight simulation systems according to their abilities to model various aspects of operating an airplane. The agency also wants to determine what effect such systems might have on pilot training. Preliminary studies at several universities that offer flying programs show that PC-based systems can help students learn faster and more efficiently.
—*Alfred Poor*

**Flight Link's accessories, such as the control panel, make Microsoft's *Flight Simulator* even more lifelike.**




**More than half of the 750 users who answered PC MagNet's survey said their firms do not plan to use pen PCs this year.**

## Pen Computers

CONTINUED FROM PAGE 29

sheet and the *Day-Timer Pen Scheduler* personal information manager. Both programs were written from the ground up for pens, but will people feel compelled to buy a $4,000 machine to run them?

Finally, vendors are splitting into three camps: those with pens and keyboard, those with pens alone, and those who prefer to wait and see what happens.

The first pen computers capable of running Microsoft's Windows for Pen Computing or GO's PenPoint operating system, the $4,995 Momenta Computer and NEC's $4,099 UltraLite SL20/P, come with both pen-sensitive screens and keyboards to help users make the transition to the pen platform. They don't require a pen but they can run one. Pen-only tablets from NCR and Samsung will be available by mid-year. IBM, AST, Compaq, Dell, and Toshiba are also expected to enter the tablet market this year.
—*Christopher Barr*

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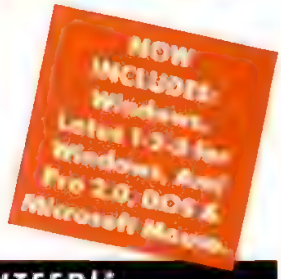


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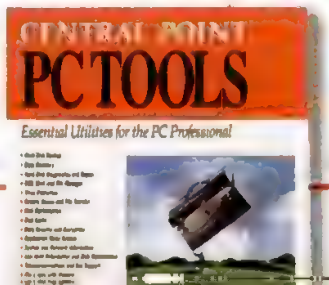


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# First Looks

*Hands-on Reviews of the Latest Products*

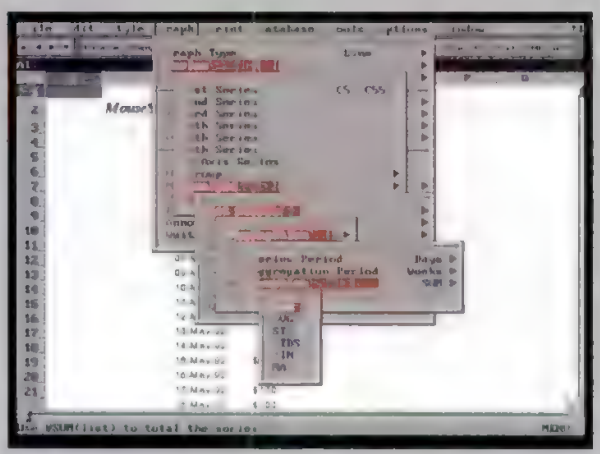
## Quattro Pro 4.0: Improvements Add Up to the Ultimate DOS Spreadsheet

HANDS ON
By Craig Stinson

With *Quattro Pro,* Version 4.0, Borland International has delivered an emphatic message to its installed user base. Although intent on making a dramatic splash in the Windows spreadsheet market (see the sidebar "What Windows Will Bring"), the company has no plans to abandon its DOS users. The newest *Quattro Pro* ($495) is the most extensive revision for Borland's character-based spreadsheet and provides welcome new analytic functionality, improved *NetWare* support, background printing, and a host of other conveniences, including the annual enhancements to its presentation features.

The most visible change is probably also the least significant. In its WYSIWYG display mode, *Quattro Pro* now wears a mouse palette across the top of the screen, directly below the main menu. Like the SmartIcons of *Lotus 1-2-3 for Windows,* but unlike *Microsoft Excel*'s toolbar, the Borland palette can be tailored to give single-click access to commonly used commands. Two "speedbars" are provided, one for Ready mode and one for Edit mode. In non-WYSIWYG displays, these palettes run vertically at the right edge of the display, replacing Version 3.0's button bar.

Because the program's default speedbar includes a Sum button, *Quattro Pro* users—like *Excel* and *1-2-3/W* users—can now create summation formulas for a whole block of columns or rows with a click of the mouse.



*Quattro Pro* 4.0's graphing module includes commands for aggregating, smoothing, and fitting straight lines and curves to data series.

*Quattro Pro* is the only major spreadsheet package to offer bubble charts—*x,y* charts in which each point is surrounded by a circle scaled to reflect the point's position on an additional data series. Much more important, the program now has "analytical graphing" commands. With these, you can take a series of daily sales figures and quickly convert it into a series of monthly sums or averages. The aggregation period can be any interval, standard or arbitrary, and any of *Quattro Pro*'s statistical functions can be applied to the aggregated data. Unfortunately, there is no way to plot every *n*th point.

Other options let you automatically generate moving averages (weighted or unweighted) or plot the curve or line that best fits a scattergram. You can funnel the aggregated or transformed

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## Keyboard and Pen: Can Momenta's Notebook Combine and Conquer?

HANDS ON
[illegible]

The first wave of the pen computer revolution brought forth a number of proprietary systems designed for specific types of data collection. The Momenta 1/40, the first "pentop" computer, represents the second wave.

The Momenta combines a keyboard and an LCD panel with a built-in digitizer. You can use it as a pen-only machine, or attach the 82-key keyboard and use it as a notebook. While the first wave of hand-held and clipboard pen systems used relatively weak CPUs, pentops (which include the NEC UltraLite SL20/P), use a 386SX or SL processor. Tablets, the soon-to-arrive third wave, will be pen-only, 386-based systems that run either Microsoft's Windows for Pen Computing or GO Corp.'s PenPoint. (For more on the future of pen computing, see the Trends section in this issue.)

The Momenta is a sleek-looking wedge with the screen pitched to facilitate writing. A base unit contains the motherboard, the hard disk, and the I/O ports, while the optional external floppy disk drive connects to the parallel port. The reflective LCD panel is hinged in the front so it can be tilted for a better viewing angle. It reacts to the pen's point on the screen to create "ink." The pen itself is connected to a 26-inch cord and can be plugged into either side of the screen to accommodate both

CONTINUES ON PAGE 42

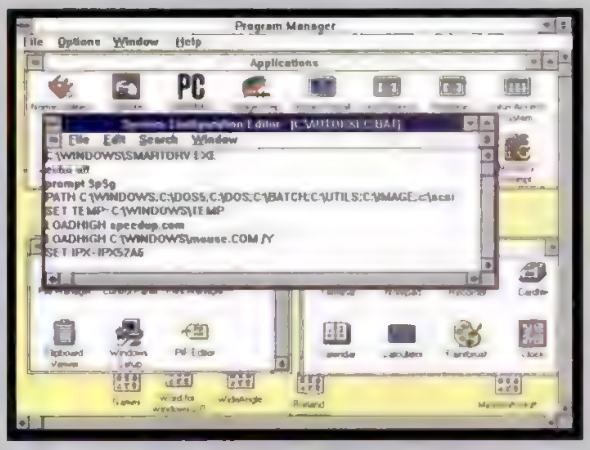
# Windows 3.1 Performance: Disk and Video Show Big Improvements Over Win3

HANDS ON
by Bill Bettini, Matthew J Ross, and Don Willmott

As contributing editor Gus Venditto points out in this issue's in-depth exploration of the new version of Microsoft Windows ("Windows 3.1 Brings More of Everything," page 123), Windows 3.1 is better than 3.0 for a wide variety of reasons. The abolition of UAEs (Unrecoverable Application Errors), the arrival of OLE (object linking and embedding), the WYSIWYG printing, the TrueType fonts, the new File Manager, and the multimedia features all are good reasons to upgrade.

But a big question remains: What about raw performance? Is Windows 3.1 faster than Windows 3.0? Will it feel more responsive when you get it up and running?

In a word, yes. The good news is that Windows has picked up speed, and with the right configuration, you'll see a significant improvement. PC Magazine Labs tested Windows 3.1 and found it much faster than 3.0 on both disk and video performance tests.




In Windows 3.1, the SMARTDrive disk cache, which greatly improves disk performance, is installed as an .EXE file in your AUTOEXEC.BAT file and can be configured from the DOS prompt.

### BETTER CHIP, BIGGER IMPROVEMENT

PC Labs' most important finding may influence the type of hardware purchases you make in the next couple of years: The improved performance of Windows 3.1 will be most obvious on 386DX or 486 systems with hard disks that are register-level-compatible with the Western Digital 1003 standard. That's because Microsoft's new FastDisk disk-interface technology includes 32-bit features that work only in 386 Enhanced mode.

To look for Windows 3.1 performance improvement on different types of processors, we tested Windows 3.0 versus Windows 3.1 on three separate systems:

- a 20-MHz 386SX-based Toshiba T2200SX notebook with 6MB RAM, an 80MB IDE hard disk, a 2MB SMARTDrive disk cache, and a VGA display;
- a 25-MHz 386DX-based Compaq Deskpro 386/25M with 8MB RAM, a 300MB IDE hard disk, a 2MB SMARTDrive disk cache, and a Compaq Advanced VGA (SVGA) display;
- a 33-MHz 486DX-based IBM PS/2 Model 90 XP 486 with 8MB RAM, a 160MB SCSI hard disk with a 512K hardware cache controller, a 2MB SMARTDrive disk cache, and an integrated XGA display.

### NEW SMARTDRIVE

Windows 3.1 includes Version 4.0 of the SMARTDrive disk cache, a cache that helped Windows 3.1 show an average 560 percent performance increase over Windows 3.0 on PC Labs' disk tests. Much of the improvement is due to write-behind caching, which holds disk writes in RAM until the moment when they will least impact software performance.

In disk testing, the 386SX notebook with an 80MB IDE hard disk showed a 232 percent performance improvement from Windows 3.0 to 3.1, the 386DX with a 300MB IDE hard disk showed a 273 percent increase, and the 486DX with the 160MB SCSI hard disk and 512K cache controller racked up a 1,175 percent increase.

Our testing also revealed that the combination of the new SMARTDrive and a hardware disk cache worked very well; the results for the IBM PS/2 system are proof of that. Interestingly, the performance of the SCSI hard disk and cache controller when used with Windows 3.0's SMARTDrive was actually slower than the Compaq's IDE hard disk when tested in the same scenario. Big improvements have indeed been made.

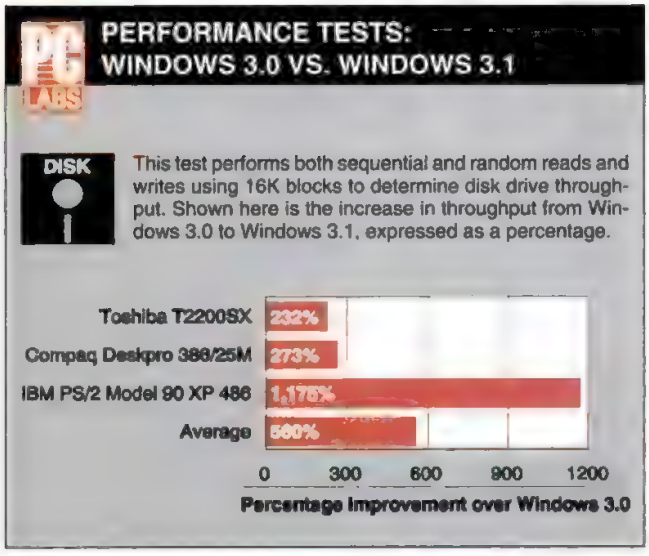
### VIDEO BREAKS THE SPEED LIMIT

Windows 3.1 showed a 28 percent performance increase over Windows 3.0 on the Windows Graphics component of PC Labs' performance tests.

In video testing, it was clear that the more powerful the processor, the greater the improvement from Windows 3.0 to 3.1 would be. The 20-MHz 386SX system improved 16 percent, the 25-MHz 386DX system (with 32K external processor RAM cache) improved 31 percent, and the 33-MHz 486DX system (with 8K internal and 64K external processor RAM cache) improved 37 percent.

Video performance improvements can be attributed in part to GDI.EXE, Windows' Graphical Display Interface (the program that communicates between the video subsystem and its driver), but the real key to the improvement in video is the new optimized display drivers shipping with Windows 3.1.

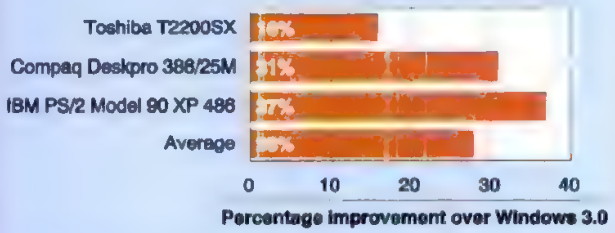
One of the advantages 3.1 gives you is the ability to experi-



## PERFORMANCE TESTS: WINDOWS 3.0 VS. WINDOWS 3.1

VIDEO

To illustrate the findings from WINBENCH 2.56, PC Magazine Labs has developed WINMARK, a graphical representation of the weighted mean of 11 WINBENCH graphics tests. The weighting reflects the graphics functions most frequently used by applications running under Windows, including line draws, BitBlts (bit-block transfers), area fills, and scrolling.




ment with display drivers, including SVGA and XGA, to find the optimal configuration for your system (though you have to restart Windows each time you try a new one).

It's important to get an improved driver loaded if you want to maximize Windows 3.1 performance. If, for example, you have a SVGA system, Windows 3.1 should automatically detect it and install the appropriate driver. If it doesn't, get the new Windows 3.1 SVGA driver from the vendor of your video board. For a detailed list of Windows 3.1–compatible drivers and how to get them, see the chart on page 235.

### FASTDISK PLAYS MEMORY TRICKS

Another secret to Windows 3.1's success is FastDisk. This technology reduces the time Windows takes to switch from Real mode to Protected mode by virtualizing the disk controller's BIOS. The benefit is noticeable only in 386 Enhanced mode (and is therefore unattainable on 286-based machines).

By bypassing the BIOS for its virtual memory paging, FastDisk lets memory-intensive operations, such as loading several large applications simultaneously or using *Adobe Type Manager*, enjoy greatly improved performance in Windows 3.1.

## Windows Talk On MagNet

Microsoft Executive Vice President Mike Maples will be PC MagNet's on-line guest from April 10 to April 13. If you have questions about Windows 3.1 or about other Microsoft applications, look for him in MagNet's Editorial Forum (GO ZNT:EDITOR).

### UPGRADE AND OPTIMIZE

Even without painstaking optimization, Windows 3.1 is a crisper performer than 3.0. If you take the time to install the software carefully, make sure that you've got the right display driver, and configure your SMARTDrive cache optimally, your Windows computing will be faster and more enjoyable than ever before. ■

# WINDOWS 3.1 APPS ARE READY

**by Carol Levin**

Being Windows 3.1–compatible is one thing; capitalizing on 3.1 features is another. Your Windows 3.0 programs will not only work in Windows 3.1, they'll run faster and be safer from UAEs. But there's one caveat: The more an application depends on a device driver, the greater the chances of conflict. Luckily, developers have been quick to eliminate this risk.

Take, for instance, *MicroPhone II for Windows*, Version 2.0, a communications package that uses its own fast communications driver rather than the one in Windows 3.0. To use *MicroPhone* 2.0 with Windows 3.1, you have to edit your SYSTEM.INI file to tell *MicroPhone* to use Windows' new comm driver instead. Or you can upgrade to Version 2.1, which automatically uses the new comm driver and allows connections above 19,200 bps. (You may need to contact the vendor of your VGA board, memory manager, disk cache, and type manager for updated drivers. See the compatibility guide on page 235.)

### READY TO TAKE ADVANTAGE?

Though close to 80 software developers are publicly committed to building in new Windows 3.1 features, only a few are ready today. Here is a partial list of applications that are available now (or expected to ship about the same time as Windows 3.1) that not only work in concert with 3.1, but implement at least one feature new to Windows 3.1.

Lotus's *Ami Pro*, Version 2.0, supports OLE, TrueType, and hooks into the multimedia tools via macros.

NewQuest Technologies' personal information manager, *Ascend*, Version 4.0, creates "sound notes" and implements OLE, drag-and-drop, and TrueType.

*Harvard Graphics for Windows* from Software Publishing Corp. supports TrueType, and uses the Media Player and Sound Recorder to add video and sound to presentations.

*Mathematica for Windows* 2.1 from Wolfram Research will support OLE, drag-and-drop, and TrueType.

Software Ventures Corp.'s *MicroPhone II for Windows*, Version 2.1, supports drag-and-drop and TrueType.

*Microsoft Word for Windows* 2.0 currently supports OLE, drag-and-drop, and TrueType; *Microsoft Excel*, Version 4.0, uses the multimedia tools to record sound and continues to provide OLE, drag-and-drop, and TrueType; and the new *Microsoft Professional Toolkit for Visual Basic* supports OLE, drag-and-drop, TrueType, and multimedia.

Autodesk's *Multimedia Explorer* uses the Sound Recorder and the Media Player to play back animation and MIDI sound files.

Hewlett Packard's *New Wave* 4.0, a productivity enhancement shell for Windows, supports OLE, drag-and-drop (also supported in previous versions), TrueType, Media Player, and Sound Recorder.

*The Norton Desktop for Windows* 2.0, from Symantec/Peter Norton Group, implements drag-and-drop (also supported in previous version), and TrueType.

*ObjectVision* 2.0 from Borland International implements OLE, drag-and- drop, TrueType, and multimedia.

Polaris Software plans to release an update to *PackRat*, Version 4.0, that will bring drag-and-drop abilities to the popular PIM.

*Peachtree Accounting for Windows*, Version 5.0, supports OLE and TrueType.

Aldus's *Persuasion*, Version 2.1, supports OLE.

*Q+E*, Version 4.0, from Pioneer Software will implement OLE, drag-and-drop, and TrueType.

VisiSoft's *VisiNet for LAN Manager*, *NetWare*, and *SNMP* support OLE, drag-and-drop, and TrueType.

## Quattro Pro 4.0

CONTINUED FROM PAGE 37

numbers into one of six graph series and plot them, either alone or alongside the original data. A Table command writes the transformed information onto the worksheet.

As if these were not enough good ideas, mouse users can perform graphing transformations with Zoom-and-Pan. This lets you magnify areas of interest (the axes are automatically rescaled, provided you haven't assigned manual scaling) and turn the result into a separately named graph that you can print by itself or display in a slide show.

Another major addition to *Quattro Pro*'s analytic prowess is the Optimizer, an integrated version of Frontline Systems' *What-If Solver* add-in for *1-2-3*. (A similar version is bundled as an add-in with *Excel* 3.0.) Using linear and nonlinear programming techniques, the Optimizer finds combinations of inputs that produce an optimal effect on a designated target cell while meeting specified constraints. The Optimizer replaces the linear-programming module that was supplied with *Quattro Pro* 3.0.

Programmers may now enhance built-in capabilities with user-defined functions. (A separately sold toolkit is required, and functions must be written in C or C++.) A $49.95 add-in kit of financial functions was not ready in time for this review but should be available this spring. The kit, developed for Borland by Tech Hackers, includes 49 functions for complex date arithmetic, cash-flow analysis, amortization and yield calculations, and probability analysis.

### SMARTER PRINTING

Like *1-2-3*, Release 2.3, *Quattro Pro* 4.0 now includes an optional print spooler. To use it, you load a TSR from the DOS command line before invoking the spreadsheet. The TSR uses about 18K of memory, spools print jobs to disk, and lets you monitor and manage its queue via a special window. *NetWare* users can also specify any network print queue as the default output device, and monitor and manage jobs spooled to that queue.

*Quattro Pro*'s analytic graphing features make it easy to plot moving averages alongside untransformed data.

Important news for former *Lotus 1-2-3* users and those who work in multi-vendor environments is 4.0's support (import only) for the .ALL, .FM3, .FMT, and .WK3 file formats. Multipage .WK3 files read into 4.0 are broken down into separate *Quattro Pro* worksheets (up to 32 pages), and formulas that transect pages are reconstructed using *Quattro Pro*'s linking syntax.

The translation of *Allways*, *Impress*, and WYSIWYG files is not perfect. Formatting codes embedded in WYSIWYG labels turn to junk in *Quattro Pro*, WYSIWYG text fields are ignored, centered labels that spill left and right in *Allways* do not in *Quattro Pro*, and fonts and rules do not match as well as you might like. Still, the support is good enough that you usually won't have to re-create complex formatting from scratch.

The upgrade also offers on-the-fly font scaling using Bitstream technology, thereby eliminating the font-building delays that irritated users of earlier versions. Other publishing enhancements include support for named styles (you can use this feature to get beyond the eight-font limit of Version 3.0) and user-definable numeric formats. The latter let you display unit text beside numbers, force leading zeros, assign fill characters for check-writing purposes, identify dates by their weekday names, and more. Unfortunately, there's still no way to build a scaling factor into a custom numeric format.

Among other improvements are block insertions and deletions (allowing macro writers to adjust code without trashing worksheet logic), sorting by column, copying formats separately from values, password-protecting formula cells only, and adding annotations to range-name definitions.

On the performance side, nothing appears to have changed. Benchmark worksheets tested in the new and old versions turned in identical times.

Version 4.0 should bring a lot of good cheer to current and prospective *Quattro Pro* users. There may be more innovations coming in *Quattro Pro for Windows*, but Borland is making sure that those who prefer character-mode spreadsheets that can run on any PC aren't left behind. ■

## WHAT WINDOWS WILL BRING

If you're a *Quattro Pro* user, you may well be wondering whether to spring for Version 4.0 or just wait to see what the Windows version will bring. Based on a very early preview, here's what you can expect from *Quattro Pro for Windows*.

The Windows version will handle multipage worksheets, as do *1-2-3 for Windows* and *1-2-3* 3.1. A 3-D *Quattro Pro* worksheet will be called a notebook, and its bottom edge will display tabs for easy mouse navigation. The tabs will have simple letter names, but you can change those to descriptive titles to help you recognize the contents of each page at a glance.

Borland will use the right mouse button for context-appropriate shortcut menus. Right-click on any object, and the menu that appears will offer commands for formatting and editing that object. You can also expect to see more mouse palettes, each tailored for the current working context.

Three-dimensional graphs will be fully rotatable. Graph creation and customization in general should be much easier than in the DOS version because direct manipulation with the mouse will replace the trek through menus and submenus.

Application developers will be able to create custom menus and dialog boxes. Users of all kinds will enjoy application integration via DDE (dynamic data exchange), OLE (object linking and embedding), and the Windows Clipboard. But unlike the current *Quattro Pro*, the Windows version won't run in 512K or anything close to it. And performance, at this point, is anybody's guess.—*CS*

### FACT FILE

***Quattro Pro*, Version 4.0**
Borland International, 1800 Green Hills Rd., P.O. Box 660001, Scotts Valley, CA 95067; 800-331-0877, 408-438-8400.
**List Price:** $495; upgrade from previous versions, $79.95; competitive upgrade for *Lotus 1-2-3* and *Microsoft Excel* users, $99.95; upgrade for those who bought previous version after 7/1/91, $49.95; for those who bought previous version after 12/24/91, free.
**Requires:** 512K RAM (640K recommended), DOS 2.0 or later (3.3 or later for LAN use), 6MB hard disk space.
**In Short:** With Version 4.0, *Quattro Pro* gets new analytical power, support for network print queues, hooks for third-party custom functions, background printing, on-the-fly font scaling, named styles, user-defined numeric formats, and more. It's the most extensive revision yet of Borland's stellar spreadsheet.

CIRCLE 429 ON READER SERVICE CARD

*There was a time when we all worked* QMS-PS 1700 *individually. We each had a computer and we each had a printer. Today, many of us work in groups. We choose our computers for their ability to perform well within networks. Shouldn't the same criterion now apply to our printers?*

# How to Spot the True Network Printer Among a Host of Imitators.

## 1-800-523-2696 EXT 2933

The Rom card gives control over the the LAN administrator printer's settings.

Unlike most printers that merely claim to be appropriate for network applications, the QMS-PS® 1700 was conceived and built to be the most efficient printer there is in a network environment. In terms of cost, as well as performance.

Proprietary software that resides within a 25 MHz RISC controller is what sets this printer apart from all others.

It handles PostScript® documents up to six times faster than the more common 68020 microprocessor. And it's the heart of an architecture you'll find in printers that come from QMS and only QMS. We call it Crown.

Consider whether its benefits would help your group work even more efficiently.

The QMS-PS 1700 recognizes incoming data and selects the right printer language without troublesome software reconfigurations.

The QMS-PS 1700 connects to Ethernet® networks configured as DECnet®, TCP/IP, NetWare®, or EtherTalk™ protocols or to Token Ring configured to support the NetWare protocol. And it can be shared between multiple computers with different operating systems.

Its input buffers spool jobs so that host applications aren't hung up waiting for files to print.

The input capacity of the QMS-PS 1700 is 1,000 sheets. Output is 500. And there's an optional duplexer for two-sided work.

What's more, if a job is interrupted for any reason, this printer has the intelligence to reprint any needed pages and then continue.

Its context switching capability preserves "states," such as fonts and macros, when switching between emulations so you don't waste time downloading them each time.

Font or emulation storage can be expanded with optional internal and external SCSI hard drives.

So the QMS-PS 1700 is much more than a laser printer. In fact, it's exactly what most work groups need but haven't been able to find. Until now. The QMS-PS 1700 is The Network Printer.

QMS

| | QMS-PS 1700 | HP III Si |
|---|---|---|
| Both 300 and 600 DPI resolution | ✔ | |
| Concurrent interfacing | ✔ | |
| Spooling | ✔ | |
| Context switching | ✔ | |
| Security system | ✔ | |

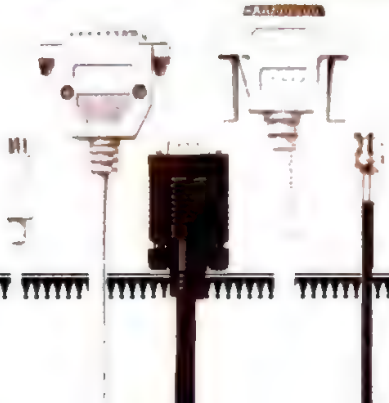
You could compare the QMS-PS 1700 to the HP III Si, but there really is no comparison.

Multi-res lets you switch between the exceptional output of 600 dpi and the speedier 300 dpi resolution.

Crown architecture. Proprietary hardware and software design that make our printers The Network Printers.

The QMS-PS 1700 printed this file in 62 seconds. The competition took 180 seconds. We're almost 3 times as fast.

Simultaneous Interface Operation, or SIO, lets the printer work over all its interfaces at once.



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Camera sample created using Micrografx Designer® software

PostScript is a registered trademark of Adobe Systems Incorporated. All other brand names and products are trademarks or registered trademarks of their respective holders.

CIRCLE 141 ON READER SERVICE CARD

## Momenta 1/40

CONTINUED FROM PAGE 37

left- and right-handers.

The Momenta has a $4,995 list price, but with dealer discounts and promotions should have a street price under $4,000. It comes with MS-DOS 5.0, Momenta Software Environment applications, and Windows for Pen Computing. It's equipped with a 40MB hard disk, 8MB RAM, an internal fax/modem, and standard serial and parallel ports.

Why design a combination pen and keyboard? Momenta Corp. doesn't think the market is ready for a pen-only system. Momenta's philosophy is that for now, a pentop computer should do double duty as both a pen-centric computer and a notebook computer. In fact, a Momenta spokesperson described the unit as the "Trojan horse" of pen computers; including the keyboard is a way of getting the pens into corporations, where their value will be appreciated once pen applications become more available. When Momenta began shipping at the beginning of the year, no pen-only applications were available to exploit the pen platform.

### AS A NOTEBOOK

When considered as a standard notebook, the Momenta comes up short. While the base unit measures only 2.5 by 11.8 by 10.4 inches (HWD), the external keyboard makes portability cumbersome. And the Momenta lasted just over an hour on PC Magazine Labs' Battery Rundown test. Our test is run with all power-saving features disabled, so your mileage is likely to be somewhat better.

In the future, Momenta will offer optional nickel hydride batteries that should last about 30 percent longer than the supplied nickel cadmium batteries. Although the base unit with battery and keyboard weighs 7.7 pounds, the power supply, carrying case, and optional saddlebag case add 6 more pounds to the package.

The Momenta 1/40's LCD screen/digitizer accepts pen input. Adding the keyboard turns it into a conventional notebook.

On PC Labs' benchmark tests of CPU speed and conventional memory speed, the Momenta made a poor showing. When compared with conventional 20-MHz notebook computers tested by PC Labs, the Momenta was the slowest in both categories. On the hard disk tests, the Momenta turned in average scores.

One area where the Momenta stood out was in the Direct Screen Access test, which indicates the speed of the video memory. The blazingly fast results show that the Momenta's video is tuned well and gets information to the screen quickly. But the screen is not a standard VGA screen. Momenta chose to use a CGA screen instead, which means you can't run software that requires a VGA display. Furthermore, there is no external VGA connector to which you can attach a monitor.

### AS A PEN-CENTRIC SYSTEM

The Momenta comes with a suite of applications that work under a proprietary operating environment called the Momenta Software Environment (MSE), which runs on top of DOS. MSE is a graphical environment designed to be used as pen-only, or in tandem with a keyboard. The applications include an address book, a calendar, a note-taker, a spreadsheet, a graphics presenter, and a faxing utility. Although the MSE applications are designed to cover all your on-the-road computing needs, two programs that are sorely needed are an electronic mail and file transfer program. Of course, you can drop down to DOS to run an ordinary communications program.

A hand-printing trainer application lets you train the Momenta to your printing style, and vice versa. During a 15-minute session, you'll be able to determine which of the characters you've printed the Momenta recognizes and which it does not. Not yet available at testing time was a full-function word processor that takes advantage of the handwriting recognition software. Momenta Corp. promises both e-mail and word processing applications in the near future.

We found the Momenta to be slow when switching from one application to another and were also bothered by an occasional glitch that caused the Momenta to hang; it had to be rebooted in order to run. Momenta Corp. assured us that a faster version of the software with fewer bugs is now available.

Indeed, Momenta Corp. shines in service and support. A "personal tutor" is available over a toll-free telephone line to help new users get up and running within 15 minutes.

It would be unwise to make the Momenta your machine of choice until Windows for Pen Computing and applications for it are available. The MSE applications, while well integrated, cannot replace the applications we use on a daily basis. This first version of the Momenta leaves much to be desired: A better screen, lighter weight, more applications, and more speed are all needed improvements.

Despite those shortcomings, pen computing is still in its infancy, and the Momenta machine is a brave attempt at the ideal transitional machine. We predict that Momenta will get its legs and be a long-term player. ■

### FACT FILE

**Momenta 1/40**
Momenta Corp., 295 N. Bernardo Ave., Mountain View, CA 94043; 800-666-3682, 415-969-3876.
**List Price:** With 8MB RAM, 40MB hard disk, internal fax/modem, Momenta's Software Environment, Windows for Pen Computing, DOS 5.0, *The Norton Backup*, two battery packs, carrying case, keyboard, file transfer cable, $4,995; backlight upgrade, $695; external floppy disk drive, $299; saddlebag carrying case, $79.99.
**In Short:** The Momenta system is an interesting attempt to merge notebook and pen computing. As a notebook, it's relatively slow and heavy, and the screen isn't good enough. As a pen machine, it takes advantage of several included applications and will be more useful when Windows for Pen Computing applications are available.

CIRCLE 430 ON READER SERVICE CARD

### THE SHAPES AND SIZES OF PEN PCs

Several pen-based PC designs have emerged. This table lists the specifications for models that represent four different styles. Of course, many more pen-based machines are on the way. Among those soon to arrive: The hand-held GRiD PalmPAD, the NEC UltraLite SL20/P pentop, the GRiD/SL tablet, the NCR 3125 tablet, and the Samsung PenMaster tablet.

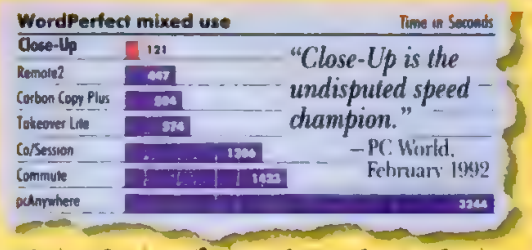
| | CLIPBOARD | TABLET | PENTOP | HANDHELD |
|---|---|---|---|---|
| | GRiDPAD/RC | MicroSlate Datellite 300 | Momenta 1/40 | PoqetPad |
| List price | $2,595 | $5,995 | $4,995 | $1,995 |
| Dimensions (HWD, in inches) | 1.4 x 9.2 x 12.4 | 2.8 x 10 x 12.5 | 2.5 x 11.5 x 12.5 | 1.3 x 9.6 x 4.6 |
| Weight (pounds) | 4.5 | 5 | 6.5 (no keyboard) | 1.2 |
| Processor | V20 | 386SX | 386SX | V20HL |
| Operating systems supported | PenRight! | PenPoint, PenRight!, Windows for Pen Computing | MSE, Windows for Pen Computing | NestorWriter, PenRight! |

## Close-Up Wins Remote Honors

PC WORLD

*Close-Up is fast, easy to use, and reliable. What else do you need in a remote package?*

**Close-Up Dual Pack 4.0** earns its Best Buy by virtue of lightning speed, an easy interface, reliable error handling, and a complete set of tools for controlling one computer from another and collaborating with a partner. It's also the only package that can run Windows reliably from afar—even in extended mode. Runner-up **Remote2** isn't quite as fast, and its toolbox is smaller, but it is perfectly dependable with graphics.




*"Close-Up is the undisputed speed champion."*
—PC World, February 1992

Excellent ★★★★
Good ★★★
Fair ★★
Poor ★

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Carbon Copy Plus 6.0 | 671 | ★★½ | ★★½ | ★★ | ★★★½ | ★★½ | ★★ | ★★★½ | ★★½ |
| Control Point Commute 1.1 | 673 | ★½ | ★½ | ★★ | ★★ | ★★ | ½ | ★★★★ | ★★ |
| Close-Up Dual Pack 4.0 | [illegible] | ★★★★ | ★★★★ | ★★★★ | ★★★★ | ★★ | ★★★ | ★★★ | ★★★★ |
| CO/Session 6.0 | 674 | ★★★½ | ★★½ | ★½ | ★★ | ★★★½ | ★½ | ★★★½ | ★★½ |
| pcAnywhere 4.03c | 675 | ½ | ★★ | ★½ | ★★★★ | ★★ | ★ | ★★★½ | ★½ |
| Remote2 2.1 | 676 | ★★★ | ★★★★ | ★★½ | ★★½ | ★★★½ | ★★½ | ★★★½ | ★★★ |
| Takeover Lite 2.0 | 677 | ★½ | ★½ | ★★ | ★★★ | ★★★ | ★★★ | ★★★½ | ★★ |

Overall value is calculated by multiplying each category rating by the category's weight percentage, summing the results, and rounding to the nearest half number.

Now Supports Both Windows & DOS

***Remote Performance: Why Close-Up is Best***

- *Supports both Windows and DOS with the same program.*
- *Fastest VGA, EGA and CGA graphics.*
- *Fastest file transfers and remote screens.*
- *Runs Windows in all 3 modes. No restrictions.*
- *Runs multiple Windows and DOS applications simultaneously, full-screen or windowed.*
- *Remote mouse and keyboard control.*
- *Self-installing, fully-automated for fast, easy operation.*

Call for FREE Working Model

*Actual test results reprinted from PC World's Review of Remote Communications Software, February 1992.*

# "Close-Up...The Best Program You Can Buy for Remote Control"

—Reprinted from PC Magazine, January 14, 1992

## The Ultimate Remote Program

***"Norton-Lambert's Close-Up is the fastest, easiest, and the most reliable program we looked at..."*** —PC World, February 1992

The results are in and the experts agree. New Close-Up® 4.0 has proven time and again to be the most advanced remote control system available.

Close-Up lets you view & control PCs miles away *by modem.* Now with full support for Windows, DOS, graphics and mice at record-breaking speeds, Close-Up is the fastest, easiest way to handle all your remote communications needs.

## What You Can Do:

- ✔ Take control of PCs at any location.
- ✔ Work remotely on the road via laptop.
- ✔ Control your office PC from home.
- ✔ Access your company's branch offices.
- ✔ Train your associates on any application.
- ✔ Help customers miles away, remotely.
- ✔ Transfer text, data, any file between PCs.
- ✔ Remotely install and run Windows.
- ✔ Automate remote operations at night.
- ✔ Access networks all over the world.

| PC MAGAZINE | PC WORLD BEST BUY | LAN TIMES RECOMMENDED NETWORKING | PC MAGAZINE EDITORS' CHOICE |
|---|---|---|---|
| January 1992 | February 1992 | November 1991 | February 1992 |

## Winner of the Top Awards

***"Close-Up has been highly polished and it's flexibility and capability clearly make it the best program you can buy for remote control."***
—PC Magazine "Best of 1991," January 14, 1992

***"If you're serious about going remote, check out Close-Up. The program's handling of Windows is simply dazzling."***
—PC World "Best Buy," February 1992

***"Close-Up is one of the fastest products we've seen. It had the fastest file transfer times and the shortest times redrawing the screens."***
—LAN Times, November 18, 1991

***"You will not find a better all-around remote-control program."***
—PC Magazine "Editors' Choice," February 25, 1992

## Control both Windows and DOS with just one program

Now with double the remote power, Close-Up gives you full support of *both* Windows and DOS. That's like getting two remote programs for the price of one!

### Spectacular Savings!

Now you can receive the Close-Up 4.0 Dual Pack including both sides for only $199—you save $240!

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Upgrade your current remote program to new Close-Up 4.0. Call for special pricing.

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Limited time offer. All prices in US Dollars. Prices exclude shipping. © 1992, Norton-Lambert Corp.

CIRCLE 028 ON READER SERVICE CARD

# Microsoft Project for Windows 3.0: Improved Resource Leveling

HANDS ON
By Henry Farsko-Weiss

When *Microsoft Project for Windows* arrived two years ago, it set a new standard for the user interface of project management programs. It gave users control over the look of nearly every aspect of the display for charts and tables and let them combine views in almost limitless variety. At the same time, it was an extremely easy program to use.

Version 3.0 (there was no Version 2.0) has stretched the standard further, making the program even easier to use and adding several planning features. Microsoft has also fixed the major problem that plagued the first version: the resource leveling.

### NEW TOOLBAR

One of the most obvious changes in the $695 *Project* 3.0 is the addition of a toolbar similar to those found in many other Windows apps. The buttons (or icons) on the toolbar let you perform common project management tasks with one click of the mouse. You can save a project; preview the active view; cut, copy, and paste; link and unlink tasks; find over-allocated resources; bring up the task or resource edit forms; display the resource assignment or tracking forms; mark a task as 100 percent complete; change the time scale; or run a macro.

You can redesign both the toolbar and the individual buttons through a dialog box. You can attach your own buttons to any command, macro, or custom view. *Project* 3.0 also lets you remove buttons or move them around on the toolbar. With all this flexibility, it's easy to customize the toolbar to get one-click operation for the functions you use most.

Another enhancement is the increased use of double-clicking. For example, double-click on the Gantt chart background and up pops a palette dialog box that lets you change the shape, color, and pattern of the task bars; double-click on the connection between tasks on the PERT chart and up pops the Dependency dialog box.

The program lets you change the start of a task, its duration, or the percent complete by dragging the whole task bar or its ends on the Gantt chart. In any view with a table you can drag column and row dividers to adjust their size; you can drag links between task boxes on the PERT chart. Another interactive feature lets you assign predecessors and successors with mouse clicks if you have both a task view and task form on the screen at once.

### OUTLINING AND COMBO VIEWS

Outlining and combination views continue to make scheduling and tracking projects very easy. Outlining gives you the ability to build a project schedule with summary tasks simply by typing task names and indenting. Unfortunately, you can only use outlining with tasks, not with resources or costs. Combination views let you put together any task view with any resource view or have two task and two resource views at once. This way, you can see an overview of your schedule as you work at the detail level, or work with both tasks and resources at the same time. Combination views can be saved under a toolbar button for easy access.

Although *Microsoft Project for Windows* is easy to learn and use, Microsoft has added a learning device that gives new users an interactive assistant. This feature, called Planning Wizards (similar to the Page Wizards found in *Microsoft Publisher*), lets you select from among four operations: creating a new project, working with columns, setting preferences, or resolving conflicts. In each case, the Planning Wizards walk you through the process and provide explanations and hints along the way. As you get your work done, you also learn how the program works. The Wizards' help in creating a new project is particularly good. Even if you've never used a project management program before, the Wizards will help you create a project quickly.

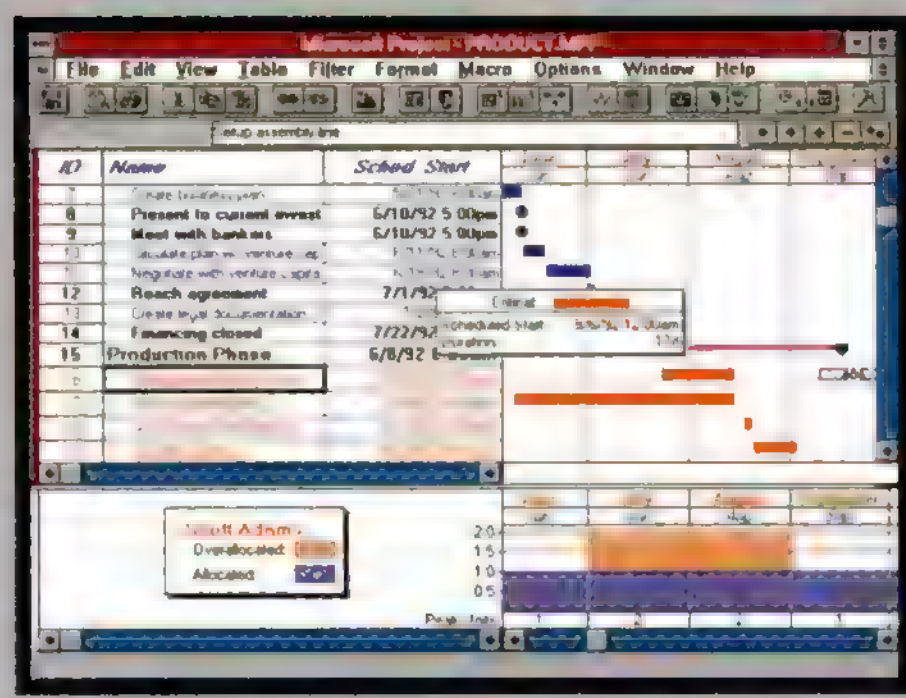
### NEW REPORTS AND PREVIEWS

Besides the usability enhancements, *Project* 3.0 has added a number of new functions. In reporting, the two most important are a multiple-page print preview and a monthly calendar report. Now you can preview a Gantt or PERT chart that spans up to 32 pages, scroll both horizontally and vertically, and then zoom in on a single page at two resolutions. The monthly calendar report lets you see scheduled tasks as bars spanning dates on a typical wall calendar. These reports can show information for individuals, groups, or projects.

### BETTER RESOURCE LEVELING

*Project* 3.0 fixes the flawed resource-leveling function from Version 1.0. You can now level resources down to the minute, which greatly improves the program's results with tasks of short duration. Plus, the resource leveling algorithm has been refined. In Version 1.0, leveling might have resulted in project schedules that were far off the optimum. Now, the automatic leveling is about as good as it gets. In addition, the program now lets you have partial resource assignments and variable resource loading.

*Project* 3.0 also adds support of DDE and OLE (as both a client and server). This lets you integrate your project planning with other applications, such as *Excel*, or embed Gantt charts in programs like *Word for Windows* or *PowerPoint*. All these improvements make a very good program even better. In the Windows environment, *Project* 3.0 will be hard to beat. ■

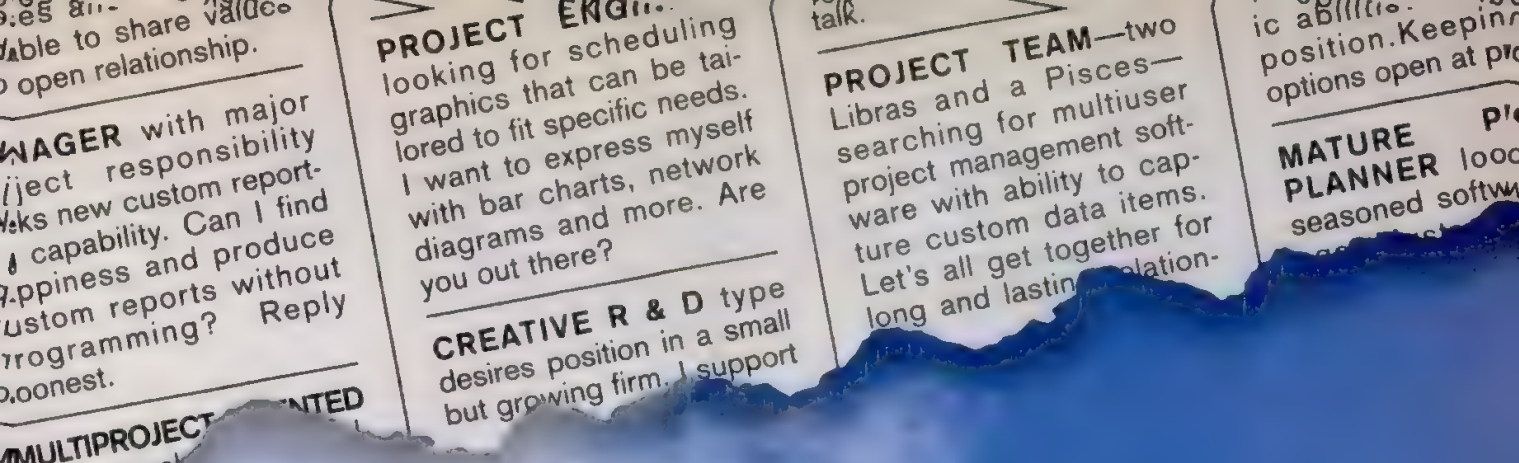



***Microsoft Project for Windows*** **3.0 has added a toolbar with buttons for commonly used operations, macros, and views. You also get great control over the display of text and chart elements.**

**FACT FILE**

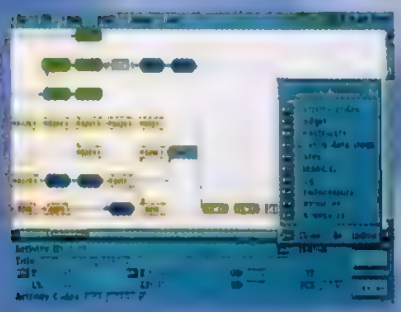
***Microsoft Project for Windows*, Version 3.0**
Microsoft Corp., One Microsoft Way, Redmond, WA 98052; 800-426-9400, 206-882-8080.
**List Price:** $695; upgrade, $149.
**Requires:** 2MB RAM (3MB recommended), Microsoft Windows 3.0 or later.
**In Short:** *Microsoft Project for Windows* 3.0 has big usability improvements. You now get a fully customizable toolbar with icon buttons that let you invoke operations, macros, or views with one mouse click.

CIRCLE 418 ON READER SERVICE CARD



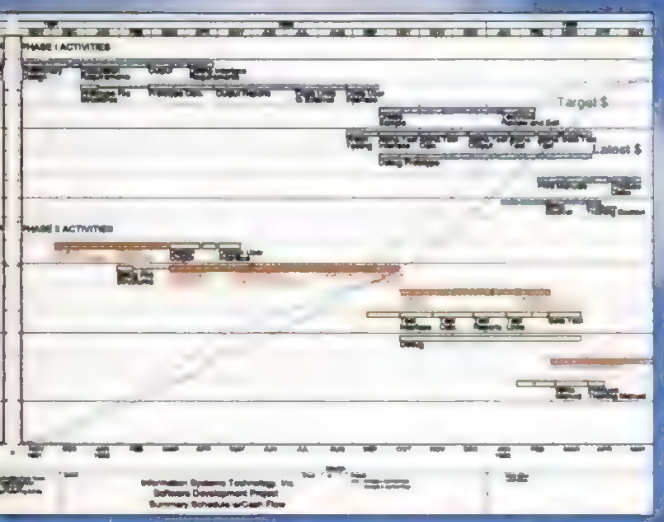

# We answered a lot of prayers with Primavera 5.0

**This could be the start of a beautiful relationship.** You and the 5.0 version of Primavera Project Planner.® It offers the power of the world's leading high performance project management software...combined with an exceptional array of customizing, "do it your way" features, reports and graphics.



Work with activity codes, budgets, predecessors and successors, custom data items and more—all within Primavera's graphic user interface.

**Highly personal custom reporting.** With the new custom reporting powers of Primavera, you can build reports that present exactly what you want, exactly where you want it. No programming required.



**Subprojects are simple.** Are you competing for resources in a multiproject environment? Primavera helps you manage your segment of the project more easily. You can schedule and level independently, or in the context of the entire project.

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**You'll find Primavera (attractively) flexible in other ways too.** If you're a traditionalist, work with forms. Is a spreadsheet format more your style? Use tables. You can also work entirely within Penguin, our graphic user interface, and build projects using fragnets from your own library of reusable network elements.

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CIRCLE 148 ON READER SERVICE CARD

# Tandy's Two New 486s: Low-Cost Competitors in The High-Power Arena

HANDS ON
By Bruce Brown

Suddenly, Tandy is taking a more aggressive stance in the desktop PC market. The Fort Worth–based vendor has introduced a pair of 486-based systems that are identical except for their processors. The Tandy 4825 SX, which lists for $1,999, is built around a 25-MHz 486SX CPU, while the $2,699 Tandy 4850 EP uses Intel's new 50-MHz 486 DX2 speed-doubled processor. These prices, although they don't include the cost of a monitor, are still competitive in the 486 marketplace.

The 4825 SX and 4850 EP share the same low-profile case. Each also has 4MB of 70-nanosecond RAM expandable to 32MB, a 120MB 15-millisecond IDE hard disk, and a 3.5-inch 1.44MB floppy disk drive. There are three horizontal 16-bit ISA slots, two serial ports, one parallel port, a 15-pin VGA monitor port, and PS/2-style keyboard and mouse ports. A 101-key keyboard and two-button mouse are also standard equipment.

DOS 5.0, Windows 3.0, and *Microsoft Works for Windows* come preinstalled with the 4825 SX and 4850 EP, and Tandy plans to provide free upgrades to Windows 3.1 for those who buy either one of the systems before June 30. The on-board Western Digital Super VGA video controller has a maximum noninterlaced resolution of 1,024 by 768 pixels. With the standard 512K video RAM, the system supports up to 16 colors, which can be increased to 256 colors if video RAM is increased to 1MB.

**The Tandy 4825 SX and 4850 EP share the same low-profile design.**

Tandy sells three 14-inch color monitors: a 0.52-dot-pitch VGA model for $399.95, a 0.42-dot-pitch model for $499.95, and a 0.28-dot-pitch Super VGA monitor for $599.

The Tandy low-profile case measures 4.25 by 15.5 by 15 inches. In addition to the standard 3.5-inch internal hard disk and 1.44MB floppy disk drive, there is an empty 5.25-inch drive bay that can accommodate either an internal storage device or one that uses removable media. Tandy sells an internal 1.2MB floppy disk drive for $159.95 and an internal CD-ROM drive with controller for $349.95. The power supply is rated at 100 watts.

### SPEED DOUBLING

The Intel 25-MHz 486SX CPU in the Tandy 4825 SX is the fastest in Intel's 486SX family. This processor doesn't have the 486DX's floating-point unit or math coprocessor, but it does have an 8K internal cache and is otherwise functionally identical to a 486DX.

The 50-MHz 486 DX2 CPU found in the Tandy 4850 EP is the first of Intel's speed-doubling chips (see Trends, March 31, 1992). The chip's design enables systems with a 25-MHz external bus to use a CPU that processes internal instructions at 50 MHz. The DX2 also includes a floating-point unit.

The advantage for users is higher performance for lower cost. The chip itself, the motherboard, and the support chips are less expensive in SX system designs than they are in 50-MHz 486DX designs, and those cost savings are being passed on to buyers.

Most 50-MHz 80486 systems have external caches in addition to the 486 family's internal 8K cache, but the motherboard design for the Tandy 4825 SX and 4850 EP does not include one. Performance comparisons of the 4850 EP with conventional 50-MHz 486 PCs should reflect this fact. The Compaq 50M, which also uses the 50-MHz 486 DX2 (see First Looks, April 14, 1992), includes a 256K cache on its CPU module and costs $4,999 with 8MB RAM and a 120MB hard disk.

On our benchmark tests, the 4850 EP was faster than the 4825 SX in two cases: 61 percent faster on the processor tests and 18 percent faster on the memory tests. The drive and video performances, which were both very respectable, didn't differ significantly since both systems have the same 25-MHz external bus.

Options from Tandy for both systems include 2MB RAM upgrades for $199.95, an internal 2,400-bps modem for $99.95, and SCSI hard disks (202MB, $1,399; 440MB, $2,199; required SCSI controller, $350). The 4825 SX is sold with no hard disk for $1,699, and a $2,799 multimedia version including a CD-ROM drive, a 16-bit audio adapter, and multimedia software is also available.

Both Tandy 486 machines are appealing systems. The 4825 SX is an inexpensive 486 entry point, and the 4850 EP, with its near-50-MHz performance, offers significant processing power at a very reasonable price. ■

**List Price:** Tandy 4825 SX, $1,999; Tandy 4850 EP, $2,699. Both with 4MB RAM, 120MB hard disk, 1.44MB floppy disk drive, Super VGA video circuitry with 512K video RAM, DOS 5.0, Microsoft Windows 3.0, mouse. Tandy Corp., 1800 One Tandy Center, Fort Worth, TX 76102; 817-390-3011.

CIRCLE 427 ON READER SERVICE CARD

## PC LABS BENCHMARK TESTS: TANDY 4850 EP AND 4825 SX

Neither the Tandy 4850 EP nor the 4825 SX contains a secondary cache to complement the 8K internal cache found in Intel's 486 DX2 and SX processors. Tandy's speed-doubled 50-MHz system cannot match the processor score of Compaq's DX2-based system—the Deskpro 486/50M with its 256K secondary cache—since the presence of a processor RAM cache greatly impacts the performance on PC Magazine Labs' benchmark tests. Dell's 50-MHz 486DX also has a 256K cache, but its write-back design is not as sophisticated as Compaq's four-way set-associative cache.

PC Magazine Labs' Hardware Performance Tests, Release 6.0, measure the PC's processor, memory, disk, and video subsystem performance. We ran all the tests with the RAM and video cache shadowing enabled.

The **processor** test consists of eight routines that measure different aspects of the CPU's performance and its interaction with cache and main memory. We report the results in processor operations per second.

The **memory** benchmark test measures the read/write performance of the computer's first 640K of conventional memory. We report the results in kilobytes per second.

The **disk** benchmark test evaluates the mechanical drive speed, hard disk controller functions, and bus speed, using a series of small-record (512-byte and 4K) and large-record (16K and 32K) exercises that include file-create, sequential write/read, and random write/read operations. We report the results in kilobytes per second.

The **video** benchmark test consists of text and graphics routines, including text memory writes from memory to screen, screen fills, and bit-block transfers (BitBlts). We report the results in thousands of video operations per second.

| Higher scores represent better performance | Processor (operations per second) | Memory (kilobytes per second) | Disk (kilobytes per second) | Video (thousands of operations per second) |
|---|---|---|---|---|
| Compaq Deskpro 486/50M | 523.51 | 7,688.61 | 381.24 | 5,922.13 |
| Dell Powerline 450 | 520.62 | 8,253.13 | 335.10 | 4,416.85 |
| Tandy 4850 EP | 420.93 | 5,279.28 | 215.43 | 4,003.74 |
| Tandy 4825 SX | 260.92 | 4,488.55 | 212.57 | 3,995.63 |

# M-mail Adds Voice And Graphics to E-mail

By M. Kevin Thompson

Think of multimedia and you picture expertly crafted desktop presentations or sophisticated educational software. Now we're starting to see how multimedia can apply to everyday business applications as well. *M-mail*, from InterActive, brings a sort of multimedia mail with voice, text, pictures, and graphics to PCs running Windows. Much like the mail system included with NeXT computers, *M-mail* makes communicating ideas and information easy and dynamic for as little as $37 per user on large networks.

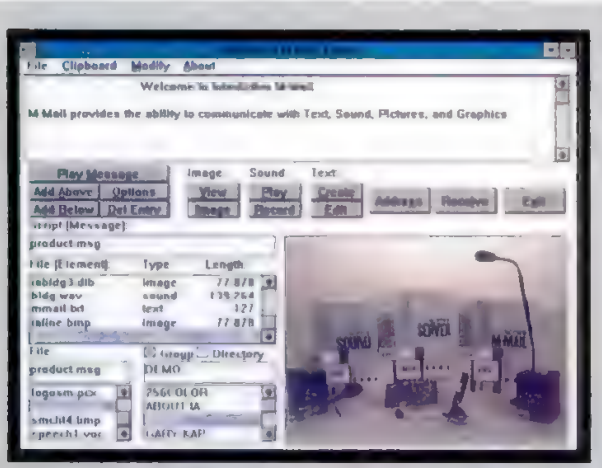
*M-mail* uses Windows' Multimedia Extensions, which provides interoperability with other Windows-based multimedia products. And since *M-mail* messages are stored as compound documents in Microsoft's RIFF (Resource Interchange File Format), you'll be able to use other multimedia software products to manipulate individual files in *M-mail* compound documents.

The program lets you integrate data from your favorite programs into an *M-mail* message. Message elements include text files, sound recordings, video captures, and other graphics files. *M-mail* records sound in Windows' .WAV format but will also play Sound Blaster .VOC files. *M-mail* views .BMP, .DIB, .MTF, and .PCX graphics files.

While *M-mail* works best with other *M-mail* users, you can also exchange files with users running other e-mail packages, since *M-mail* uses standard file formats. If you prefer, you can attach *M-mail* messages to messages that you create in your favorite e-mail program.

### WHAT IS MULTIMEDIA MAIL?

An *M-mail* message can be as simple as a text-based note or as complex as a narrated video (though you will need an optional video-capture board to produce the latter). First, using a word processor, spreadsheet, graphics program, or any other application, you must create whatever information you want to include in your message. *M-mail* presents a standard Windows list box where you select the files you want to integrate into a message. You are restricted to selecting files from one directory.




**The top part of the *M-mail* message screen displays text messages, while the bottom-right displays 256-color graphics. The left side shows the elements of a message and its associated filenames.**

You then send your message in one of two ways. When you send data as a message, *M-mail* combines all of the elements (files) into one file. To specify how you want the recipient to hear and see your message, you use a script to set time delays and automated sequencing that play back your message.

For example, you can display a bar chart in a graphics box for 20 seconds while the sound file you recorded plays an explanation of the data. Then you can display other elements of the message while the recipient listens to your comments.

The program includes a sample message to acquaint you with the system. The demo script displays a graphic, plays a voice description of the graphic, and shows a text message in the upper part of the screen. The demo comes with both 16- and 256-color images.

To get the most out of *M-mail*, your company should standardize on a graphics resolution so you can all share images in messages. Standard Windows VGA drivers use only 16 colors in 640-by-480 mode. To display 256 colors, you need a 640-by-480 256-color driver from your video board manufacturer. For current standard business applications, 16 colors is adequate, but with the proliferation of high-resolution graphics, 256 colors is the minimum.

With an optional video-capture board such as VideoLogic's DVA board, *M-mail* can play or capture frames from a video input device such as a VCR or video camera. The program then stores video captures in .IMS or .IML formats. (Image Small displays 320-by-200 resolution and Image Large displays 640- by-480 resolution.) *M-mail* can also convert the images to .BMP files so users who do not have a video capture board are able to view them.

### FOUR CONFIGURATIONS

InterActive offers *M-mail* in four configurations. The software-only solution works with Covox, Sound Blaster, and other sound boards and costs $169. InterActive offers network licenses in 5- to 100-user packages, bringing the cost down to $37 per user. A $249 server program is required for each network to notify users of incoming mail.

There are also three software/hardware packages that come with the Covox Voice Master Key sound board. The $295 package includes a headset; the $359 package has a speaker and hand-held microphone; and the $395 package comes with a speaker and desk-mount microphone.

Currently, the InterActive hardware product is not MPC compatible, but InterActive is working on a software driver to make the board MPC compliant. In addition, the sound board does not have a MIDI port, so your messages cannot play MIDI music.

As good as *M-mail* is, it could use some improvements. The program requires the system administrator to manage an *M-mail* user list separately from the network user list. A better approach would be for *M-mail* to get its user information from an existing *NetWare* Bindery or other network user list. Fortunately, this capability as well as greater connectivity with other mail systems will come with the addition of MHS support, planned for mid-1992.

The program also requires that all of the files included in a script be stored in one directory, limiting flexibility in the way you normally store your files.

*M-mail* wraps up text, graphics, data files, and sound, and delivers multimedia mail to networked Windows environments. Easy to use and reasonably priced, *M-mail* is an interesting glance at the future. ■

### FACT FILE

***M-mail*, Version 1.0**
InterActive Inc., 204 N. Main St., Humboldt, SD 57035; 800-292-2112, 605-363-5117.
**List Price:** $169, *M-mail* System I with sound board, $295; *M-mail* System II/III with sound board, speakers, and microphone, $359/$395.
**Requires:** 2MB RAM, Windows 3.0 or later, sound board, speaker, microphone.
**In Short:** An exciting new multimedia mail package that brings NeXT-like electronic mail to PCs running Windows.

CIRCLE 419 ON READER SERVICE CARD

# 4DOS Gives You the Conveniences DOS Doesn't

HANDS ON
by Edward Mendelson

*4DOS*, JP Software's $69 substitute for DOS's command processor (COMMAND.COM), transforms DOS into a faster, leaner operating system with dozens of added conveniences, safety precautions, and customization options that Microsoft has never provided.

The new *4DOS*, Version 4.0, does virtually everything that COMMAND.COM isn't smart enough to do by itself. It performs all its tricks from a single compact program, adding features normally available only from add-on utilities that eat into memory. *4DOS* typically gives you 3K more RAM for application programs than you get with COMMAND.COM.

You don't need to look at the manual to benefit from *4DOS*. An automated installation program loads the software. The DOS prompt appears in lowercase and commands like DEL and COPY give detailed reports of what they've done. If you press the Cursor Up or Cursor Down keys, you can scroll through earlier commands and edit them. (Microsoft's DOS does this only when you load its separate DOSKEY utility.)

Expert users can explore *4DOS* commands' other possibilities through its hypertext help system. Among its most convenient is SELECT, which lets you specify another command, such as COPY, and then use a point-and-shoot menu to choose the files you want copied. You can also use a command line and wildcards to specify files.

*4DOS* lets you use different colors for different file extensions and attach descriptive names to directory entries.

*4DOS* lets you customize every aspect of the directory display, including different colors for specified filename extensions. A built-in MOVE command lets you copy and then delete files or directory trees. For safety, you can test the effects of commands without actually performing them.

Like DOSKEY, *4DOS* supports aliases—sequences of commands accessed with a single name—but lets you access them with one keystroke. Batch files are read into memory at one time, not line by line, so they execute faster than their DOS counterparts.

An earlier version of *4DOS* comes with *The Norton Utilities*, but the latest version is stronger and simpler. *4DOS* does almost everything you need, adds to RAM, and effortlessly gives you conveniences that no self-respecting operating system should be without. ■

**List Price:** *4DOS*, Version 4.0, $69. **Requires:** 512K RAM, DOS 2.0 or later. JP Software, P.O. Box 1470, East Arlington, MA 02174; 800-368-8777, 617-646-3975.

CIRCLE 420 ON READER SERVICE CARD

# Org Plus for Windows Draws Your Organization

HANDS ON
by Gregg Keizer

If a picture is worth a thousand words, then an organization chart exposes a thousand secrets. One glance at a well-crafted chart and a manager can spot people and positions, tell who reports to whom, and track the sometimes Byzantine paths to decision makers.

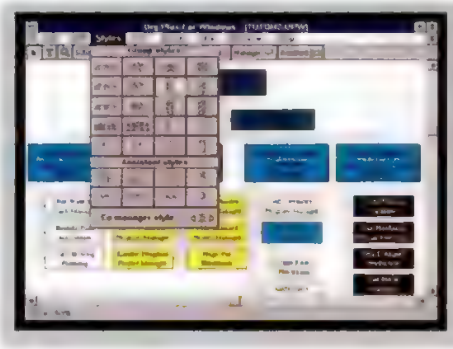
The current leading maker of these corporate pictographs is the character-based *Org Plus Advanced* program, which recently won an Editors' Choice award for both its flexibility and features ("Five Programs That Can Make Sense Out of Any Organization," December 17, 1991). Banner Blue has followed up with *Org Plus for Windows*, a program that successfully embraces the GUI's point, preview, and print skills.

*Org Plus* isn't the first Windows org chart package—Roykore's *Instant ORGcharting!* beat it to market—but it lets you print image-packed charts, comes bundled with *Adobe Type Manager*, and offers more chart styles than its competitor.

Rather than forcing you to create charts in a text input screen, as the DOS version does, *Org Plus for Windows* lets you form new boxes, select workgroups, and shift boxes with the mouse. Changing a chart's appearance takes just a menu pick and a click on an icon. *Org Plus for Windows* offers 20 predefined styles, 13 more than the DOS version. Adding color, changing text style and font, and picking box formats are just as simple, and with the WYSIWYG interface, you see the chart's appearance at every turn.

Enhancements in *Org Plus for Windows* also include the ability to insert .BMP graphics into a chart box, support for up to 32,000 positions per chart (compared with 600 in the DOS program), and automatic title centering.

*Org Plus for Windows* retains most, though not all, of the DOS version's features. The Make Fit command remains a powerful aid in squeezing charts onto a single page, for instance, and the program even expands text fields per box from 24 to 30.



*Org Plus* has made a smooth transition to Windows. The program features 20 predefined chart styles, 13 more than the DOS version.

Although *Org Plus for Windows* allows for exporting to *Org Plus* and *Org Plus Advanced* as well as to bitmap and ASCII formats, it doesn't let you turn the chart into a TIFF file.

*Org Plus for Windows* also holds an edge over its Windows competitor, *Instant ORGcharting!* Although *Instant ORGcharting!*'s box creation is more elegant and its box placement is more flexible, *Org Plus for Windows* has a decided advantage with the Make Fit command, the in-chart picture printing, and its number of styles. Chart making couldn't be simpler than with *Org Plus for Windows*. An excellent program that's made a smooth transition to Windows, it's bound to stay at the top of the chart. ■

**List Price:** *Org Plus for Windows*, $199. Upgrade from *Org Plus Advanced*, $69.99 (special offer, expires May 31, 1992). **Requires:** 1MB RAM, 1.5MB hard disk space, Microsoft Windows 3.0 or later. Banner Blue Software Inc., 39500 Stevenson Pl., #204, Fremont, CA 94539; 510-794-6850.

CIRCLE 421 ON READER SERVICE CARD

# SmarText 2.0 Builds Hypertext Documents Automatically—Almost

HANDS ON
by Edward Mendelson

The bright promise of hypertext tends to fade when you discover how many hundreds of hours it takes to construct a hypertext document by hand. Lotus's $495 *SmarText Builder,* Version 2.0, automates much of the labor by constructing hypertext links, indexes, and outlines based on the frequency of words in your text and the page layout of the files containing your text. *SmarText Builder* won't let you build a hypertext document simply by selecting files and then taking a coffee break while it does all the work, but it gets you over the initial hurdles and makes the job of organizing a hypertext document almost enjoyable. A separate $99 *SmarText Reader* lets you read and manage documents created by the *Builder.*

Both *SmarText* packages look like Lotus's other Windows applications, especially *Ami Pro.* It has the same often obscure SmartIcon palette (which you can place anywhere on the screen), similar menus for selecting display fonts, and similar tools for managing illustrations.

## BUILDING DOCUMENTS

You start using *SmarText*'s document *Builder* by selecting text files and graphics from a file list. You can include ASCII files and text files from *Ami Pro* (and related programs like *Lotus Write* and *Professional Write Plus*), *Microsoft Word, Microsoft Word for Windows* 1.*x*, and *WordPerfect.* (You can only include *Word for Windows* 2.0 files by saving them in 1.*x* format.)

You have to select files in the order you want them to appear, and you have to remove them from the list and add them again if you want to change the order. Supported graphics formats include .BMP, CGM, Lotus's .DRW, .PCX, .PIC, TIFF, .WMF, and *Ami Pro* and *WordPerfect*'s native graphic formats.

If your word processor files are formatted with stylesheets, *SmarText* can do most of the organizing work automatically. A menu lets you associate different styles in the text files with different header levels in your electronic document, and the program then uses those headers to build an outline. If you use *WordPerfect* or ASCII files, you need to format the text by following rules in the *SmarText* manual if you want the program to build an outline automatically. Both the *Builder* and the *Reader* let you associate outline levels with specific fonts and screen colors to make it easier to navigate the structure of the file.

When *SmarText* builds a document, it creates an index of all words that aren't included in a customizable list of common words; you can modify this index later. It also looks for recurring clusters of words in your text files and automatically links backward from later occurrences of those words to the first occurrence, which it treats as a definition. These links can be modified by hand. You can also link text to graphics or to rectangular areas within graphics. If you want a user to click on a paragraph and launch another application, that too can be accomplished with a link. Users can backtrack through links to the point where they began.

Windows' Multiple Document Interface lets you iconize whole documents, document text, illustrations, outlines, and indexes. Iconized illustrations are miniature views of an illustration. You can search using Boolean operators or search for terms found only near other specified terms.

The *SmarText Builder* only creates control files and indexes to the contents of a document; it leaves your original text and graphics files untouched. You can update text or graphics using the programs that created them originally, but you have to rebuild the outline and index before the revised versions are accessible through the *Reader.*

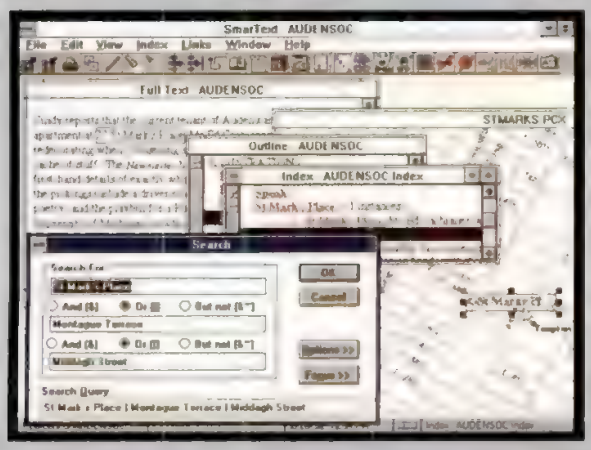
## FAST HYPERTEXT TIES

*SmarText* builds documents quickly, especially with a fast hard disk. On a 486/33 with a caching hard disk controller, the program needed less than 3 minutes to build a 45-page document from four *Word for Windows* files. Each revision of the outline takes only a few seconds, although the program pauses so long before it begins updating its outline that you'll think your computer has locked up. Control files for a 45-page document filled 250K of disk space. The program can handle up to 3,500 text files and 3,500 graphics per document, but Lotus says it's easier to manage massive data in multiple files with fewer documents in each.

*SmarText* builds basic text and graphics documents but doesn't offer the interactive audio and video links that Owl International's *Guide* 3.0 lets you build, nor does it include *Guide*'s programming language. *Guide,* however, doesn't attempt *SmarText*'s automated creation of links.

When you modify documents manually with *SmarText,* you'll be slowed down by minor annoyances. When you want to highlight a heading or paragraph to build a link or create a header, you have to select all the text by hand, without the keyboard and mouse shortcuts that Lotus builds into *Ami Pro.* Expect to find those shortcuts in the next version.

Lotus says it tested *SmarText* extensively with *Word for Windows* files, but on our tests, it consistently misread *Word*'s stylesheets and marked as a header all the paragraphs that followed the real header. We had to rewrite the outline by hand. Lotus tested the files, acknowledged the bug, and promised a fix in the near future. Meanwhile, if the hours and expertise needed to produce a hypertext document have discouraged you from making a start, *SmarText* can catapult you over the initial effort—but you'll still need plenty of human intelligence to finish the job. ■




You can search through a *SmarText*-created hypertext document using an outline, an index, and links to text and illustrations, or through searches that include Boolean operators.

**FACT FILE**

***SmarText*, Version 2.0**
Lotus Development Corp., 1000 Abernathy Rd., Bldg. 400, #1700, Atlanta, GA 30328; 800-831-9679, 404-391-0011.
**List Price:** *SmarText Builder,* $495; *SmarText Reader,* $99.
**Requires:** 1MB RAM (2MB recommended) Microsoft Windows 3.0 or later.
**In Short:** *SmarText* quickly and intelligently organizes text files into hypertext documents with links and outlines, but building such documents still takes lots of time and work.

CIRCLE 428 ON READER SERVICE CARD

# Fax, Modem, and Voice Mail On One Board: Complete Communicator Does It All

HANDS ON
by Jonathan Matzkin

The Complete Communicator 3.0 is a wonder of miniaturization. On a single three-quarter-length expansion board, it incorporates sophisticated voice mail, send and receive fax features, and a full-function 2,400-bps modem. The newest version of this little device from The Complete PC carries a list price of only $499, down considerably from the $899 price at which it debuted only three years ago. The latest upgrade also offers automatic detection and switching of fax or voice transmissions, allowing it to work seamlessly on a single phone line. That keeps pace with low-end fax machines, which have also recently begun offering this feature.

But the biggest news is that The Complete Communicator now has full support for Windows. The original DOS software is largely unchanged from previous versions, but the Windows version, *The Complete Communicator for Windows* 3.0, clearly points the way to the future.

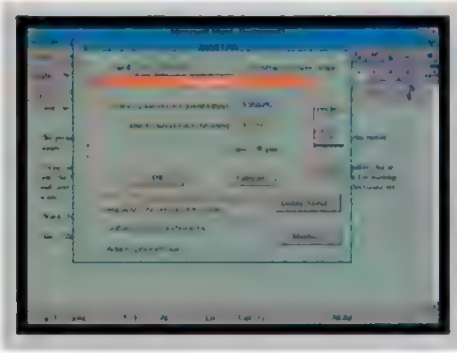
The *CCom for Windows* software installs easily and resides in the program group "CWIN." Separate icons launch the voice mail and fax software, and a third starts the largely self-explanatory configuration program. Bit Software's DOS-based *BitCom* is included, as it was with earlier versions, but any standard comm package works with The Complete Communicator's Hayes-compatible modem.

### SMOOTH FAXING

The fax software, dubbed *RapidFax*, supports a host of sophisticated functions including background operation and fax forwarding. Like other Windows-based fax software, *CCom for Windows* lets you fax a document directly from any Windows application. You simply select Printer Setup from the application's File menu and choose the *RapidFax* driver instead of your usual printer driver. When you issue the print command, *CCom* prompts for the destination fax number and other information. You can also direct the software to send the transmission at a later time.

An included macro for *Microsoft Word for Windows* makes the process even simpler. Once installed, the macro places a menu choice labeled "*RapidFax*" in *WinWord*'s File menu. Choosing that command pops up the *RapidFax* dialog box immediately; there's no need to switch printer drivers.

The Complete Communicator supports background printing on receipt if you wish, so that the device can cause your system to function like a standalone fax machine. If, for example, you leave your PC unattended, you can have incoming faxes sent directly to the printer so that they'll be available in printed form on your return.



The Complete Communicator's Windows-based software lets you fax directly from Windows apps; you can delay transmission until a specified future time.

### VOICE MAIL

The Windows interface also adds simplicity and flexibility to the voice mail component. Separate windows display messages for each defined mailbox (the system supports up to 999 mailboxes). Clicking on the summary line for a particular message plays the message through the phone handset. When voice messages or faxes are received, dialog boxes pop up on the Program Manager screen to alert you that calls have come in. As in the DOS version, the Windows implementation allows you to give callers to the voice mail system access to both your modem and fax.

### SOME SHORTCOMINGS

For all of its excellent new features, The Complete Communicator still has some shortcomings. Printed output from faxes sent using the Windows software was less than first rate. The characters were somewhat broken, almost as if printed on a dot matrix printer.

The DOS-based software lets you fax directly from DOS apps, just as the Windows software lets you fax from Win apps. But these capabilities are available only one at a time. If you are running the Windows software and want to fax from a DOS word processor, you must unload the Windows comm software and load the DOS software.

The Voice/fax mode, which distinguishes between incoming voice and fax transmissions, puts a limit of approximately 10 seconds on the greeting. If the greeting is too long, it may mask the tones transmitted by the sending fax and the system will not be able to recognize the fax transmission. This is a relatively minor limitation, but it's irritating.

The modem, too, lacks a few basic features. There is no built-in speaker, which makes it impossible to monitor the progress of an attempted connection. Most users consider a speaker to be a fundamental tool in working with a modem, and its absence is hard to understand in light of the package's many other features. There is a jack for an externally powered speaker on the back of the card, but the speaker itself should have been included.

More irksome is the modem's inability to be configured for ports beyond COM1 and COM2. This almost certainly has something to do with WIndows 3.0's weak support for COM3 and COM4, and it can create headaches when installing The Complete Communicator in systems that already have one or more serial devices. With luck, Windows 3.1's improved I/O management will at least make it easier to reconfigure preexisting ports as COM3 or COM4. In any case, it's annoying to have to work around The Complete Communicator. Better to be able to leave your existing devices alone and configure the new device as needed.

Another complaint is the size of the background software—about 150K—that is loaded from the AUTOEXEC.BAT file to intercept incoming calls. It all loads into high memory, but leaves little room for other drivers and programs above 640K.

The Complete Communicator offers a very powerful and complete set of features at an extremely low price. The new Windows software brings it up to date and takes good advantage of the facilities offered by Microsoft's increasingly ubiquitous graphical environment. There are still a few minor imperfections in this excellent product, but for most users these are outweighed by the performance and functionality it delivers. ■

**PC FACT FILE**

**The Complete Communicator 3.0**
The Complete PC, 1983 Concourse Dr., San Jose, CA 95131; 800-229-1753, 408-434-0145.
**List Price:** $499.
**Requires:** Analog telephone line with modular RJ-11 or RJ-14 connector, 4MB hard disk space. For Windows, 2MB RAM, for DOS, 640K RAM, DOS 3.1 or later
**In Short:** The Complete Communicator lives up to its name, packing voice mail, fax, and a modem into a single slot. Automatic detection of incoming fax and support for Windows adds to its value.

CIRCLE 431 ON READER SERVICE CARD

# Introducing Quattro Pro 4.0 The only DOS spreadsheet with pushbutton power!

## Borland does it again– Sorry, Lotus!

No other DOS spreadsheet gets your work done faster than Borland's new Quattro® Pro 4.0 with pushbutton power!

**Quattro Pro beats 1-2-3 . . . again!**

| New | Quattro Pro 4.0 | Lotus 1-2-3 R 2.3 | Lotus 1-2-3 R 3.1+ |
|---|---|---|---|
| **Most Powerful** | **Yes** | | |
| Intelligent Graphs | Yes | No | No |
| Novell Network optimized | Yes | No | No |
| Multiple sheets | Yes | No | Yes |
| Multi-variable solver | Yes | No | * |
| **Easiest to Use** | **Yes** | | |
| SpeedBar | Yes | No | No |
| Print-To-Fit | Yes | * | * |
| Read Lotus 1-2-3 files, styles & macros | Yes | Yes | Yes |
| **Best Performance** | **Yes** | | |
| All features in 640K | Yes | ? | No |
| Price | $495 | $495 | $595 |

? Yes, but almost no room remains for data.
*Yes, but requires attaching an add-in.

Quattro Pro's customizable, built-in SpeedBar™ is a row of clearly labeled buttons that use simple English commands to give you instant mouse-click access to your frequently used features and macros. Plus you get immediate access to a host of new features.

NEW SpeedBar

Intelligent Graphs let you perform extended analysis with your graphs without changing your data. And Quattro Pro's Optimizer™ allows you to solve complex problems using multiple variables.

NEW Intelligent Graphs

## The best spreadsheet on networks

Only Quattro Pro 4.0 gives you superior Novell NetWare support, including automatic logon, drive mapping and a new Print Queue Manager.

NEW Novell Support

## The most feature-packed DOS spreadsheet ever!

And in addition to Quattro Pro 4.0's dramatic new advances, you get the features that have made it the #1-rated spreadsheet in the world. Features such as WYSIWYG, Print-To-Fit™ spreadsheet output, superb 1-2-3® compatibility (you can even read Allways, Impress and WYSIWYG files) and more.

## Top-rated spreadsheet Top-rated company

Quattro Pro has won more awards for technical excellence and customer satisfaction than any other DOS spreadsheet. And J.D. Power and Associates ranked Borland "best application software in customer satisfaction in Small to Medium-sized and Large Businesses."[1]

Now you know why more than one million people have upgraded to the power of today's spreadsheet. Quattro Pro.

**Attention 1-2-3 users!**
Step up now!
Special Upgrade offer
**See your dealer today or call now, 1-800-331-0877, Dept.5628**

**BORLAND**
*Software Craftmanship*

[1]1991 J.D. Power and Associates® Computer End User Satisfaction Study: Phases I and III: Small to Medium-sized Businesses (responses from 1,784 business sites with 1 to 499 employees) and Large Businesses (responses from 1,094 business sites with 500 or more employees). Copyright © 1992 Borland International, Inc. All rights reserved. Pricing is in U.S. dollars. Offer good in U.S. and Canada only. Dealer prices may vary. BI 1471

CIRCLE 287 ON READER SERVICE CARD

# An open letter to dBASE users

**From Philippe Kahn, Chairman of Borland**

I am proud to announce dBASE IV® version 1.5, the first version of dBASE® since we acquired Ashton-Tate four months ago, is now available.

Version 1.5 is a faster, easier-to-use and more powerful version of dBASE. New features include mouse support, faster Query By Example data retrieval, 40 work areas, new BLANK support that lets you detect when fields are empty, open architecture Control Center, editable multi-file views, C language–like file I/O so dBASE programs can read and write files of any type, as well as other enhancements.

Borland has tested dBASE IV thoroughly. We stand behind it. In fact, to ensure your satisfaction, we'll guarantee you a complete, no-questions-asked refund, within 60 days of purchase if you are not totally satisfied.

What's next? We have several development teams working right now to build the latest technology into dBASE. For example, we will bring a dBASE compiler for Windows to market, which owners of the Developer's Edition will receive *free!* And we're putting this same technology into a DOS dBASE compiler. Of course, we will continue to enhance dBASE across platforms, including UNIX and VAX VMS.

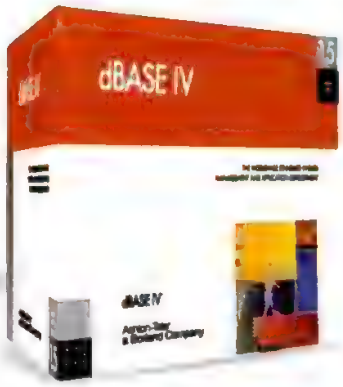
I want to make sure that I get your feedback about our dBASE products. Call my Voicemail directly at 1-800-851-2122 with your critiques and suggestions. I'll personally make sure that your thoughts are taken into full account by our development team.

At Borland, we are committed to building the products you need. dBASE IV version 1.5 is an important, first step in the right direction.

Thank You,

PKah

P.S. You can order your upgrade now.
Call 1-800-331-0877, Dept. 6343

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*Software Craftsmanship*

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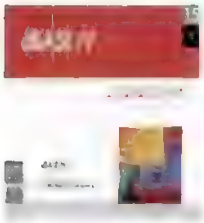
# "Have you driven dBASE lately"



### The new 1.5 model of dBASE IV is here

And it's loaded with more standard features. Like mouse support for easy maneuvering through applications. Multi-file view editing for direct updating. Query By Example (QBE) summary operators and pick lists for increased operations. And automatic installation of complex programs and configurations. So whether you're a first-time buyer or a dBASE expert, you can quickly get the best out of dBASE IV v1.5.

Mouse support

### Increased performance for faster results

Shift into the information you need sooner with the dBASE IV v1.5 new optimization technology—IQ!.™ Now dBASE has three different ways of retrieving data and will automatically choose the fastest one for you.

### Superior programmability for complex applications

Now up to 40 open work areas are possible at any one time, offering greater flexibility for more complex applications. Enhanced BLANK support gives you the power to detect empty fields for data validation and statistical operations. Plus, the widely respected dBASE Template Language is now standard in dBASE IV v1.5.

### A great product begins with the basics

Behind the new features of dBASE IV v1.5 lies the flexibility of a worldwide standard. No other database software is available on more platforms than dBASE. Add that to the dBASE Control Center with its road-tested design tools and the dBASE Programming Language, featuring integrated IBM's SAA-complaint SQL, integrated debugger, and built-in applications generator, and you have the most well-rounded database management and application development product in the world.

IQ! technology

### Technology you can build upon

There are no stop signs ahead for dBASE IV v1.5 thanks to its Open Architecture Control Center, allowing you to add third-party designers to your crew—and access additional tools—at any time.

### Borland: the new force behind dBASE

dBASE IV v1.5 marks a return of innovation and pride to the dBASE community. And now that dBASE IV v1.5 is part of the Borland family, you can expect Borland's world-renowned service and support. Now is the time to join the more than three million people who already drive dBASE.

## Get dBASE IV v1.5 now!

If you're a current dBASE user, you can upgrade to dBASE IV v1.5 for $99.95. Call and order now. If you're not completely satisfied, Borland will refund your money within 60 days of purchase. No questions asked.

**See your dealer today or call now:**
**1-800-331-0877, Dept. 6343**

Special upgrade offer

**B O R L A N D**

*dBASE IV from Ashton-Tate,® a Borland Company*

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CIRCLE 295 ON READER SERVICE CARD

# MainLanEasy: Low-Cost Peer-to-Peer LAN for the Small but Growing Network

HANDS ON
by Steve Rigney

MainLan is not a new name in the world of low-cost networks. *MainLan Ethernet* and *MainLan 386* have acquired places in the information systems of many organizations. Now an even lower-cost connectivity solution has arrived: the $199.95 *MainLanEasy*.

*MainLanEasy* is a 4-megabit-per-second local area network operating system providing several features—electronic mail, printer sharing, and security—normally found only in more expensive LAN software.

Most peer-to-peer LANs, such as Artisoft's *LANtastic*, run at 10 Mbps but cost $300 to $400 more than *MainLanEasy*. The starter kit includes two 4-Mbps ISA Ethernet cards, *MainLanEasy* software for up to six users, and 25 feet of network phone cabling. The cables have RJ-11 phone-cable connectors so you can run the network with any old 4-pair phone cable. The starter kit also includes software for both DOS and Windows. *MainLanEasy* is a NetBIOS-compatible network, so you can run any NetBIOS-compatible software.

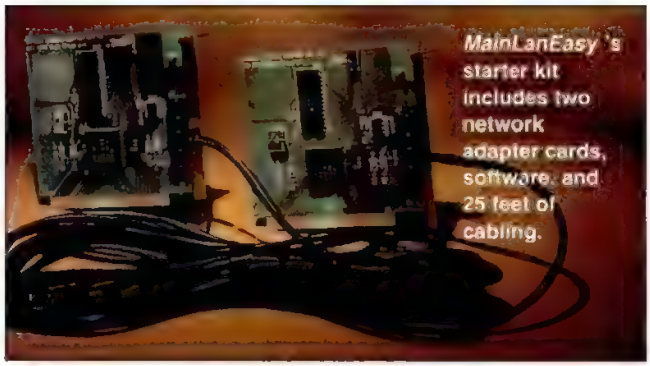
The nondedicated server requires 55K RAM or less, and each PC needs only 15K. You can load both the server program and the workstation program into upper memory blocks using a memory manager such as EMM386 or *QEMM*.

*MainLanEasy* provides easy-to-use menus for transferring files and sharing disks and peripherals. Using the File Menu commands, you can call up a listing of any shared hard disk on the LAN and copy, save, erase, or rename files on any PC acting as a MainLan Server. You can also use *MainLanEasy*'s menuing system to redirect virtual drives and subdirectories on the server's hard drive.

Printer sharing is easily accomplished from the Print Menu. You can control printer redirection from a list of available printers and use the Queue commands to monitor and delete print jobs. However, you cannot rush or prioritize print jobs.

Sending messages across the network is possible with the program's basic electronic mail program. By storing electronic messages on a PC designated as a central mail server, *MainLanEasy* allows you to receive messages at any time, even if you are not at your desk when the messages are sent. Password security is provided to ensure safety from intruders.

While 4 Mbps is not going to break any speed records, we moved 100K files between PCs in less than a second. There was no noticeable difference in start-up times when we loaded applications from a file server or from a local drive.



*MainLanEasy*'s starter kit includes two network adapter cards, software, and 25 feet of cabling.

Most of the cost of any network comes from the adapter cards, and *MainLanEasy*'s cards are proprietary, plain, and inexpensive. However, while the adapters are considered Ethernet because of the way they send and receive data, they do not conform to any specifications for signaling such as IEEE 802.3 or Ethernet. This restricts you from using adapters from any other company. (Some cards, such as the Artisoft AE-2, can be used in *NetWare* networks.) If you outgrow *MainLanEasy*, your upgrade path is limited to MainLan products.

You can purchase additional *MainLanEasy* network adapters for $99 each and increase the size of your LAN to a maximum of six nodes without buying more software.

*MainLanEasy* is designed for small and growing organizations that need basic resource sharing and the ability to expand to a larger network in the future. While the product lacks many features found in more powerful and more costly LAN packages, the price makes it attractive. ■

**List Price:** *MainLanEasy*, Version 3.33, starter kit, $199.95. MainLan Inc., 1215 N. Highway 427, #135, Longwood, FL 32750; 800-999-6770, 407-331-4400.

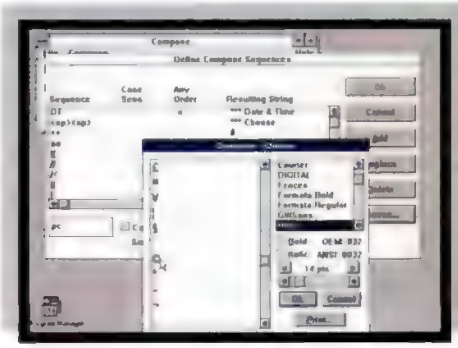
CIRCLE 423 ON READER SERVICE CARD

# DEC's Free Compose Utility Puts Special Characters In Windows Apps

HANDS ON
by Edward Mendelson

Anyone can type a character that appears on the keyboard, but if you want to type non-keyboard characters, you usually have to haul out a manual and enter some obscure numeric code.

Digital Equipment Corp.'s free *Compose* utility gives every Windows application a Compose key like the one in *WordPerfect* and *Lotus 1-2-3*. You run the utility like any other Windows program (or load it automatically by adding it to the Load line in WIN.INI) and then leave it running during your Windows session. To enter a symbol, you simply press the user-definable Compose key (the default is the right-hand Ctrl key) and then a two-character code.



DEC's *Compose* utility has a menu that lets you define codes for entering symbols. It displays all the symbols available in your fonts.

You can modify the list of codes and add abbreviations of two letters or more that expand to print any specified string. If you press the Compose key followed by D and a space, the program inserts the date; a similar code enters the time. The Compose key followed by two spaces pops up a menu of available symbols.

The program sometimes turns off pop-up menu programs such as Abacist Software's *HotWin*. You can find a copy on CompuServe's WINADV Forum, named CMPKIT.ZIP; other forums call it COMPOS.ZIP. Make sure you get the one described as a Digital utility. A similar shareware program, found on many forums as COMPOS.ZIP, does less and costs more. ■

**List Price:** *Compose*, free from CompuServe (GO WINADV) and BBSs. Digital Equipment Corp., 110 Spit Brook Rd., ZKO2-2/M28, Nashua, NH 03062. **Requires:** Microsoft Windows 3.0 or later.

CIRCLE 422 ON READER SERVICE CARD

# Unleash the power of the C with Borland C++

Professional C programmers are choosing object-oriented C++ because they know it increases productivity. And the C++ they're choosing is from Borland. Borland® C++ & Application Frameworks gives you amazing code reusability, extensibility and easier maintenance. With more than 650,000 copies of Borland's C++ products in use, Borland C++ sets the standard.

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INFO WORLD PRODUCT OF THE YEAR 1991

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**Borland C++ & Application Frameworks includes:**

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- Complete source code for both Application Frameworks and the runtime library
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**Borland C++ 3.0 includes:**

- Full C++ with templates
- ANSI C
- Global optimizer
- Precompiled headers
- Windows Development Environment
- DPMI support
- ObjectBrowser™ visually displays classes
- EasyWin™ converts DOS apps to Windows
- Resource Workshop to create Windows dialogs, menus, bitmaps, icons and more
- WinSight™ message tracking utility
- Turbo Debugger® for DOS and Windows
- Turbo Profiler™ for DOS and Windows
- Object-Oriented Turbo Assembler®

60-DAY GUARANTEE MONEY-BACK

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**ACT NOW! Offer ends May 31**

# B O R L A N D

*The Leader in Object-Oriented Programming*

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CIRCLE 398 ON READER SERVICE CARD

# DiffEq Fits Data to Complex Scientific Models

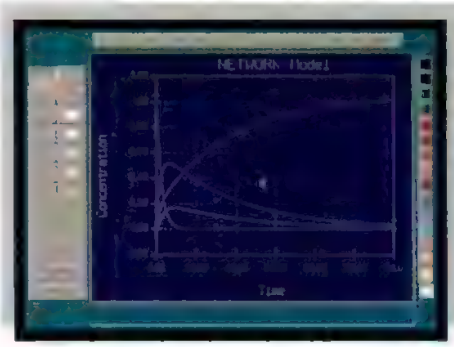
HANDS-ON
By Barry Cinnamon

The kind of mathematics needed by many experimental physical, medical, and social scientists is very different from the symbolic mathematics handled so well by programs like *Mathematica*. Typically, such scientists have experimental data, model equations, and variable parameters. Their goal is to fit the data into the model by varying the parameters to find the "best fit."

For models involving only algebraic equations, there are a number of programs that can perform the fit, but as soon as some of those equations are differential or difference equations, most of these programs get stuck. Two mainframe programs, Civilized Software's *MLAB* and SCI's *NonLin*, have been ported to the PC at prices of $995 and $595, respectively, but Micromath's $399 *DiffEq* is a more reasonably priced solution with a slick user interface that yields sharp graphics.

In *DiffEq*, you define a model with an equation file, which contains the model's basic equations with support for the essential transcendental functions. Once the model is defined, you provide values for the parameters and initial conditions and the program solves the linked differential equations.

Once the solution is found and presented in a result window, you can graph it or even produce phase portraits of the solution with varying initial conditions. These solution and graphics tools provide a clear way to explore models.




*DiffEq* does a good job of displaying best-fit curves for the data being analyzed.

*DiffEq* uses Borland's Turbo Vision interface, so its textual components are in resizable windows. It has the feel of Borland's *Eureka* program, although the mathematical methods are more sophisticated.

The graphical module is extensive. You can choose among several fonts, all of medium quality. There are simple drawing and annotation tools, but here the user interface stumbles. At times, you make a menu choice with the mouse but you can't continue without taking your hand off the mouse to hit Enter. The use of the same button to draw a symbol and to change the symbol on a curve is confusing.

Nevertheless, if you want to fit data to models with differential equations, you should seriously consider *DiffEq*. ■

**List Price:** *DiffEq*, Version 2.0, $399. **Requires:** 640K RAM, DOS 3.0 or later. Mouse and math coprocessor recommended. Micromath Scientific Software, P.O. Box 21550, Salt Lake City, UT 84121; 800-942-6284, 801-943-0290.

CIRCLE 424 ON READER SERVICE CARD

# IntelliLink 2.2: The Software Connection From Desktop to Palmtop

HANDS-ON
By Jonathan Kamin

Though palmtops such as the Hewlett-Packard HP95LX and the Sharp Wizard are simply too tiny for serious word processing or spreadsheet work, they do a great job of acting as convenient, portable containers for big chunks of data.

To play this role well, palmtops must efficiently exchange data with larger hosts. Palmtop manufacturers supply cables, but the software that accompanies them is often primitive.

The $99 *IntelliLink*, from Intellilink, is a major step forward in the effort to make your palmtop and desktop machines a smoothly functioning team. This Windows application serves as a data hub between the major palmtops, including the HP95LX, the Wizard, and the Casio BOSS, and PIMs like Polaris's *PackRat*, Borland's *Sidekick* 2.0, and IBM's *Current*. *IntelliLink* also supports Asymetrix's *Daybook* and allows limited information exchange with *dBASE*, *Lotus 1-2-3 for Windows*, *Microsoft Excel*, *Microsoft Word for Windows*, and *Paradox*.

*IntelliLink*'s Function Mapping dialog box lets you specify a destination for data from each of a palmtop's applications.

### RIGHT FIELD

The main problem in palmtop-to-desktop information transfer is in reconciling field structures in the palmtop's built-in apps with the field layout of the desktop software. *IntelliLink* automatically formats palmtop data for the supported desktop apps, and does the same trick in reverse when you download data to your palmtop.

You configure *IntelliLink* for your combination of hardware and software by first identifying the palmtop you are using. Next, you specify a destination for data transferred from each of the palmtop's built-in apps. You have to specify a destination (such as *Current* or *PackRat*) for each of the palmtop's apps (such as the phone list or appointment scheduler). That's annoying if you intend to use a single desktop PIM, as most users probably will. Intellilink promises that the next version will have a global selection option.

In addition to translating between palmtop and desktop data layouts, *IntelliLink* offers another convenience: It identifies scheduling conflicts when you transfer your appointments from the palmtop to the host system. When the program comes across a conflict, it pops up a dialog box that identifies the problem and gives you the choice of accepting or rejecting the incoming appointment. Unfortunately, this doesn't work when moving your schedule from the palmtop to the host.

Intellilink plans to broaden both hardware support (Psion and Poqet are on the way) and software support. Lotus's *Agenda* and Chronologic's *Instant Recall* would be good additions. In the meantime, *IntelliLink* makes the products it supports into much more useful tools. ■

**List Price:** *IntelliLink*, Version 2.2, for Sharp Wizard and Casio BOSS, $99; for Hewlett-Packard HP95LX, $149. **Requires:** 2MB RAM (4MB recommended), Microsoft Windows 3.0 or later, appropriate PC-to-palmtop cable. IntelliLink Inc., One Tara Blvd., #6, Nashua, NH 03062; 603-888-0666.

CIRCLE 425 ON READER SERVICE CARD

OBJECTVISION™

# VERY EZ

WINDOWS APPLICATION CREATION

# Get your creative license to Windows

Everyone wants custom Windows applications. But delivering them is easier said than done. Until now. With new ObjectVision™ 2.0 from Borland you can create full-fledged Windows applications quickly *and* easily. Now you can get creative.

## Visual programming makes it easy

Using ObjectVision 2.0, you create complete Windows applications visually. Simply **draw** the application interface with the WYSIWYG forms tool, **add** the program's underlying logic in the form of graphical decision trees (much like a spreadsheet), then **connect** to your data. You can do it all just by pointing and clicking. No programming language is needed! Here's what you'll use:

- **ObjectBar™ and Property Inspector:** Add objects and set their properties with a simple tap of the mouse button.
- **Incremental Development:** See the results of your work instantly. There's no waiting through a compile/debug step.
- **Event Trees:** Trigger any action through an *event* such as clicking the mouse or closing a form. Event trees can be attached to any object for full control of the application's behavior, including custom menus, external commands, data manipulation and more.
- **More than 150 spreadsheet-style @functions.**

And you get **free** runtime and password protection! So now you can distribute applications at no cost and, if necessary, password-protect them to prevent modifications.

## With power to spare!

ObjectVision comes with an incredible array of features designed to simplify your Windows development:

- **DLLs:** Connect to standard DLLs or create your own in C, C++ or Pascal. You can even execute callbacks and ObjectVision functions in DLLs.
- **Filters:** Can be attached to links letting you create sophisticated form-based queries.
- **OLE client:** Will link to any OLE server.
- **SQL connection** (available separately): for Sybase, SQL Server and MDI gateway to DB2.
- **Intelligent Prompting™:** Asks the user for necessary information at the *right* time and in the *right* sequence. Decisions are based on value tree logic.
- **Integral data connections:** Link ObjectVision fields to database fields found in Paradox,® dBASE,® Btrieve and ASCII formats. Just point and click. You can even create new database files in these formats!

Plus you get unlimited flexibility with one-to-many database links, virtual fields, cascading delete/updates and a host of other options.

## Get a license to save

ObjectVision has a suggested retail price of only $149.95. Buy now and receive a $10 rebate directly from Borland.* To order or upgrade . . .

**See your dealer today or call now, 1-800-331-0877, Dept. 5136**

**BORLAND**

*The Leader in Object-Oriented Programming*

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CIRCLE 285 ON READER SERVICE CARD

800 925·6616

by Emerson Andrew Torgan

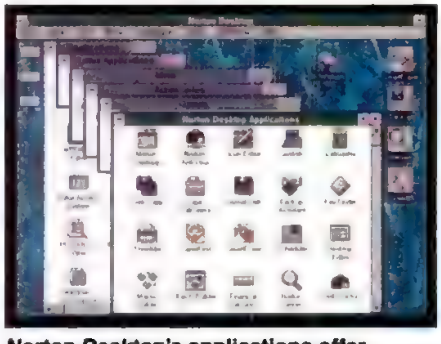
# New & Improved

*News of Announced Products and Upgrades*

## Norton Desktop: Faster Load Times, Global Drag-and-Drop

**IMPROVED** The first version of *The Norton Desktop for Windows* received high praise as a replacement for Windows' Program Manager and File Manager but was hampered by slow load times and the lack of a facility for automatic arrangement of icons if the default settings were changed. *The Norton Desktop for Windows*, Version 2.0, loads up to six times faster than its predecessor, according to **Symantec.** This version is also ready to take advantage of Windows 3.1.

*NDW* now offers global drag-and-drop support for all features, including a new antivirus tool that lets users drag a Drive icon and drop it on the AntiVirus icon to scan drives and files for infection. TrueType and tape backup support have also been added, as well as a DOS restore feature for backups made with either the DOS or Windows versions of *The Norton Backup*.



***Norton Desktop*'s applications offer features from *The Norton Utilities* as well as *The Norton AntiVirus* program.**

Automatic desktop arrangement and the addition of over 30 new file viewers are among the new enhancements, along with a macro building tool, a Windows text-file editor, and a Network Install option compatible with most of the popular network protocols.

*NDW* requires a minimum of 2MB of RAM (3MB recommended) but also includes an uninstall program for complete removal from the system. Users can also remove specific modules to regain valuable disk space.

**List Price:** *The Norton Desktop for Windows*, Version 2.0, $149; upgrade from Version 1.0, $49. Symantec Corp., 10201 Torre Ave., Cupertino, CA 95014-2132; 800-441-7234, 408-252-3570.

CIRCLE 402 ON READER SERVICE CARD

## SuperStor 2.0 Makes Compressed Data Accessible

**IMPROVED** **AddStor**'s data compression software package now has the ability to write compressed data to floppy disks. *SuperStor*, Version 2.0, also allows systems not running the program to access compressed files and to read and save the data in expanded format.

The new technology developed by AddStor is known as Universal Data Exchange (UDE). UDE lets any DOS-based PC utilize any file compressed by the program, whether it is running *SuperStor* or not. This feature enhances the transportability of compressed files, according to the company.

The new version includes defragmentation and consolidation tools to speed data access and a recompression tool that promises to shrink compressed files by an additional 10 to 20 percent.

**List Price:** *SuperStor*, Version 2.0, $139; upgrade from Version 1.3, $29. AddStor Inc., 3905 Bohannon Dr., Menlo Park, CA 94025; 800-732-3133, 415-688-0470.

CIRCLE 403 ON READER SERVICE CARD

## Claris Leaves Its Mark on Update Of Hollywood

**IMPROVED** When it was acquired from IBM Desktop Software, *Hollywood*, Version 1.0, became **Claris Corp.**'s first Windows product. *Claris Hollywood* 1.0v2, the com-

CONTINUES ON PAGE 60

### HOT PROSPECT

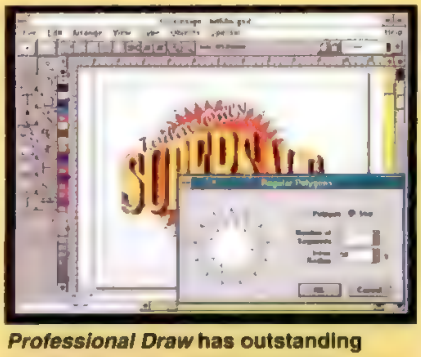
### GOLD DISK'S PROFESSIONAL DRAW LAUNCHES $495 CHALLENGE IN GRAPHICS ARENA

One of the more intriguing features of **Gold Disk**'s new graphics illustration package is its price—$200 less than *CorelDRAW* and Micrografx's *Designer*. Running under Windows 3.0 and 3.1, *Professional Draw* offers users a WYSIWYG interface and editing in both preview and outline modes.

Five basic drawing tools—line, rectangle/square, ellipse/circle, arc, and Bezier curve—are selected from push buttons. A total of 23 drawing methods and various text effects can be applied. A set of "facilitators" lets users control the creation and placement of objects and allows snapping of lines and objects to the center of other objects or to corners and edges. Ruler guides and grids are provided for page layout of text and graphics.

*Professional Draw* features many desktop publishing capabilities, such as multiple page layout, text flow through multiple frames, and wrapping or curving text around (or within) graphics. Color features include 24-bit process and spot color and linear and radial graduated fills.

In addition to the low price tag, the package provides extensive import/export file compatibility and reads *CorelDRAW*'s .CDR and Corel Systems' .WFN font files, *Designer*'s .DRW files, and *Adobe Illustrator*'s .AI files. Gold Disk is making *Professional Draw* available for $129 as a one-time offer to users of *CorelDRAW, Designer, Adobe Illustrator, Arts & Letters, FreeHand, Windows Draw, PageMaker,* and *Ventura Publisher*.



***Professional Draw* has outstanding drawing tools (including CAD-like snap-to grids) and strong text manipulation.**

**List Price:** *Professional Draw*, $495. Gold Disk Inc., 5155 Spectrum Way, Unit 5, Mississauga, Ontario, Canada, L4W 5A1; 416-602-4000, 310-320-5080.

CIRCLE 401 ON READER SERVICE CARD

## BRIEFS

DESKTOP PCs

**Tandy** is now shipping the 4833LX/T ($3,995), a tower model based on a 486DX/33 processor. The unit comes standard with 4MB RAM (expandable to 64MB using 4MB SIMM modules), seven expansion slots, a 1.44MB floppy disk drive, and an SVGA noninterlaced video adapter. The 4833LX/T does not include a hard disk in standard configuration. A variety of hard disk configurations are available, ranging from a 52MB model to a 440MB SCSI model. 817-878-6875.

**Wyse Technology** has unveiled the Decision 386/40 ($1,999), which is based on AMD's 40-MHz 386DXL processor. The unit comes standard with 4MB RAM (expandable to 64MB using 4MB SIMM modules), a 128K memory cache (expandable to 256K), seven expansion slots, a 1.44MB or 1.2MB floppy disk drive, and four half-height storage bays. The unit ships without a hard disk. 120MB and 200MB hard disks are available as options. 800-438-9973.

**Xi Computer**'s Xi450 Workstationer ($2,995) features a 486 processor running at 50 MHz. The unit ships standard with 4MB RAM, a 120MB hard disk, 128K of write-back cache memory, and 1.44MB and 1.2MB floppy disk drives. 800-432-0486, 714-498-0858.

PORTABLE PCs

**AddTech Research**'s SlimPro is a portable 386SX-based PC designed to be used with a standard monitor and keyboard. The 11.5- by 10.75- by 2.25-inch unit is targeted at users who want secure data transportation or who prefer using the same computer at home and in the office. The SlimPro is available configured with a 386SX/25 processor ($525) or a 286/16 processor ($425). 510-623-7583.

**Aquiline** has unveiled a 5.5-pound notebook PC based on the 386SL/25 processor. The Aquiline Arima SL ($2,495) ships standard with 2MB RAM (expandable to 10MB), a 40MB hard disk (expandable to 120MB), and a 10-inch paper-white VGA display. Options include a docking station and an internal fax/modem. 802-442-1526.

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pany's first update of the presentation graphics software, is now shipping with an improved interface, enhanced data-handling capabilities, and new packaging clearly identifying it as a Claris product.

*Hollywood* sports a narrower toolbox, tool buttons that are easier to read, text editing inside the slide view mode, and a resizable screen for viewing data in outline mode. New data-handling features let users save and open user-definable graphics libraries. Additional enhancements include support for TrueType and *Adobe Type Manager* fonts and an expanded outliner capacity of up to 13,000 characters. *Hollywood* also offers cross-platform file importing from Claris's Macintosh program as well as from popular DOS-based programs such as *Harvard Graphics* and *Excel*.

**List Price:** *Claris Hollywood*, Version 1.0v2, $499; upgrade from *Hollywood*, Version 1.0, $15. Claris Corp., 5201 Patrick Henry Dr., P.O. Box 58168, Santa Clara, CA 95052-8168; 408-727-8227.

CIRCLE 404 ON READER SERVICE CARD

## Perceive Personal Not Confused by Text Effects

**IMPROVED** **Ocron**'s latest version of its optical character recognition (OCR) software for hand scanners, *Perceive Personal*, Version 2.0, now reads ligatured, underlined, bold, and italic characters as well as proportionally spaced characters and draft-quality dot matrix output. The package also features a new auto-merge function that allows multiple text scans to be merged into a single file for full page recognition.

Ocron claims better than 99 percent scanning accuracy when reading characters ranging from 8 to 36 points at a resolution of 300 dpi. *Perceive Personal* is available in both DOS and Windows versions in the same package, and the Windows version reads 11 European languages. It supports a number of popular hand scanners, including those from Logitech, Marstek, and Nisca. Output formats include a number of popular spreadsheets, databases, and word processors.

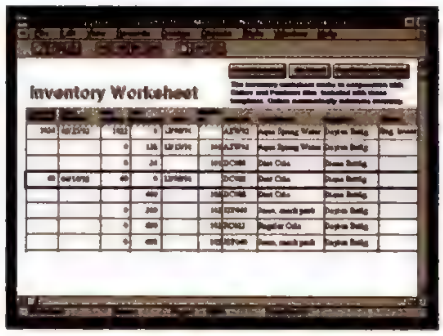
**List Price:** *Perceive Personal*, Version 2.0, $195. Ocron Inc., 3350 Scott Blvd., Bldg. 36, Santa Clara, CA 95054; 408-980-8900.

CIRCLE 405 ON READER SERVICE CARD

## A New "Approach" to a Database for Windows

**NEW** Functioning as either a standalone relational database for Windows or as a Windows front end for *dBASE*, *Paradox*, and *Oracle SQL*, *Approach for Windows*, Version 1.0, lets users generate reports, forms, and mailing labels. The program also sports **Approach Software Corp.**'s proprietary PowerKey Technology, which lets users open, manipulate, and update data from each of the three supported database formats across a network simultaneously.

*Approach for Windows* is a combination of a Windows interface, a relational layer, and three database engines. It supports OLE (object linking and embedding), query by example, and joining of up to 10 data files. Files can include up to eight field types, and .BMP, .EPS, .PCX, TIFF, and Windows Metafile graphics can be stored and imported to spice up documents.




***Approach for Windows* can link files from three supported formats and combine the information into a single report.**

**List Price:** *Approach for Windows*, Version 1.0, $399. Approach Software Corp., 311 Penobscot Dr., Redwood City, CA 94063; 415-306-7890.

CIRCLE 406 ON READER SERVICE CARD

## Mitsubishi Offers CYMK Printing At 300 Dots per Inch

**NEW** Utilizing dye-sublimation technology, the DiamondColor Print 300 color printer offers photographic-quality output at a rate of 100 seconds per page, according to **Mitsubishi.** The $14,995 unit provides four-color (CYMK) printing with continuous-tone color and color-correction features on special media. The front-mounted control panel features color correction capabilities that let users manipulate sharpness, contrast, relative color values, and brightness.

The DiamondColor Print 300 features a standard 32MB buffer, allowing it to store an 8.1- by 11-inch image for multiple prints without resending data to the unit each time. DOS and Windows drivers are included, and both four-color and monochrome (for 256 gray-scale printing) ink sheets are available.

**List Price:** DiamondColor Print 300, $14,995. Mitsubishi Electronics America Inc., Information Systems Division, 5665 Plaza Dr., Cypress, CA 90630; 714-220-2500.

CIRCLE 407 ON READER SERVICE CARD

# Now Windows is as easy to use as DOS.

Microsoft® Windows® is capable of great and wonderful things.

But if you're among the many who've traded the frustration of the C: prompt for the graphical confusion of Program Manager, relax.

You're about to discover what half a million delighted DOS® and network users already know.

That the shortest distance between you and your programs is straight through Direct Access.

It's the world's best-selling menuing software. And as soon as you install it you'll understand why.

Direct Access searches your disk, gathers your programs into logical groups and builds menu screens just like the one you see at the top of this page.

All by itself.

That's right. You just load it and forget it.

Whenever you want an application, all you have to do is hit one key.

Or, if you prefer, click one mouse.

The more applications you have on your disk, the more you'll delight in Direct Access.

That's because Program Manager insists on grouping your programs into five arbitrary categories: "Windows Applications," "Non-Windows Applications," "Accessories," "Games" and "Main."

Not very intuitive, eh?

Direct Access, on the other hand, gives you a multitude of utterly sensible program groupings – 17 of them.

And that doesn't count the customized ones you dream up yourself.

What does all this mean to you?

It means you can get to a spreadsheet by simply clicking "Spreadsheet." Summon a word processor by stroking "W." And access a DBMS by selecting, you guessed it, "Database."

*Direct Access searches your hard disk, groups your applications logically and generates menus and submenus automatically; All you have to do is point and click.*

You can even park your favorite programs right on the main menu and ask for them by name.

Hey, we didn't call it Direct Access for nothing.

If the only PC you're responsible for is the one on your desk, Direct Access is valuable, indeed.

But if you're responsible for a department full of PCs, Direct Access is priceless.

Suddenly all of your Windows and DOS users can follow the same quick, convenient route to their applications.

And if all those PCs are networked, so much the better. Because you can install – and customize – Direct Access on everybody's workstation without leaving yours.

You can decide for yourself precisely who gets access to which menu items.

And prevent novice users from even *looking* at DOS.

There's more. A lot more. So pick up the phone. Dial 1-800-677-1848.

We'll tell you about our one-year money-back guarantee and our vaunted toll-free customer support.

Which you can access directly, 24 hours a day.

FIFTH GENERATION SYSTEMS, INC

CIRCLE 288 ON READER SERVICE CARD

# At Okidata® one good thing

In June 1990, Okidata's OL400 personal page printer won a PC Magazine Editors' Choice award. The editors praised its overall performance and value – applauding its graphics and text quality, and its wide selection of built-in typefaces and fonts. All at the lowest suggested list price of any page printer available.

In November 1991, Okidata's new OL830 Adobe® PostScript® printer won the same coveted award. Once again, the editors praised our printer's overall performance and value. They found it to be the fastest of *all* 8-ppm printers tested in PCL (HP emulation) graphics mode. And considering its record-setting low price, they rated it "the best inexpensive PCL/PostScript printer available".*

# leads to another.

Both printers come equipped with an impressive list of standard features – including full HP Series II software compatibility, and the industry's only 5-year printhead warranty. Plus a choice of options to tailor either machine for your specific business or home-office application.

And both come with one additional standard feature: the Okidata OK! It's our pledge to you that every product bearing our good name will deliver not just acceptable, but outstanding performance and value.

OKi OK!
OKIDATA OK!

Call 1 (800) OKIDATA for the name of your nearest Okidata dealer, and ask him to show you both award-winning page printers.

We don't just design it to work. We design it to work wonders.®

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CIRCLE 235 ON READER SERVICE CARD

## BRIEFS

CONTINUED FROM PAGE 60

**BI-Link** is shipping the NB2500 series of notebook PCs based on AMD's 386SXL/25 processor. Available in configurations with 4MB RAM and a 40MB, 60MB, or 80MB hard disk, the units offer a SCSI port for connecting external peripherals such as tape drives or rewritable optical disk drives. The NB2540 (40MB hard disk) is priced at $2,645. 800-888-5369.

**LapPaq** is now offering the LapPaq 386-20SX, Model 320ex. ($3,095), a notebook PC designed with an all-metal casing for added durability. A 386/20-based unit, the LapPaq ships standard with 2MB RAM, a 40MB hard disk, a 9.5-inch display with a reverse video switch, and an internal 9,600-bps send/receive fax/modem. 800-388-5541.

**MicroWorld**'s Eclipse-SL ($3,395), a notebook PC based on the 386SL/20 processor, sports the Key Tronics KeyMouse for mouse cursor control. The unit ships standard with 2MB RAM and a 60MB hard disk. 800-325-0594.

**Tandy**'s 3820 HD ($2,999) notebook PC features a 386SX/20 processor and ships with DOS 5.0 and Windows 3.0 preinstalled on the 60MB hard disk. The 6.7-pound unit includes 2MB RAM (expandable to 8MB) and a 9-inch display. 817-878-6875.

CAD/CAM/CAE

**Aries Technology** is shipping two new modules for its *ConceptStation* series of mechanical computer-aided engineering software. *ConceptCompose* ($1,490) lets users create drawing layouts that are fully associative with Aries solid models and can be transferred to most of the popular CAD systems. *ConceptDraw* ($2,290) provides associative dimensioning and annotation of drawing layouts. 508-453-5310.

**Audas Computing** is offering *VFont*, Version 1.1 ($59.95), for use with Evolution Computing's *EasyCAD* and *FastCAD*. The collection of vector fonts contains the majority of the extended characters that do not appear in the standard fonts sets shipped by Evolution. 519-725-9079.

CONTINUES ON PAGE 66

## Cardinal and Radius Unveil True-Color Graphics Boards

NEW **Cardinal**'s VIDEOcolor24 graphics adapter board ($399) offers 24-bit color capability (over 16.7 million simultaneous colors) in 640-by-480 resolution. The board employs the Tseng Labs ET4000 (Revision F) architecture, a 24-bit color RAM DAC chip, and custom BIOS. It includes accelerated drivers for both *AutoCAD* and Windows.

**Radius**'s $1,999 MultiView 24 provides 24-bit color capability in 1,024-by-768 noninterlaced resolution, and refresh rates of up to 75 Hz. It offers accelerated Windows 3.*x* drivers and can be configured for both single and dual monitor operation. According to the company, it is the fastest 24-bit board available and runs Windows applications 3 to 20 times faster than VGA and SVGA boards running the same applications in 8-bit mode.

**List Price:** VIDEOcolor24, $399. Cardinal Technologies Inc., 1827 Freedom Rd., Lancaster, PA 17601; 800-233-0817, 717-293-3000.

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**List Price:** MultiView 24, $1,999. Radius Inc., 1710 Fortune Dr., San Jose, CA 95131; 408-434-1010.

CIRCLE 409 ON READER SERVICE CARD

## Norick Ships Paperless Office System

NEW **Norick Software**'s *Norick's Paperless Office*, Version 1.0, provides users with document imaging, send/receive fax capabilities, a Quick Note feature for networked nodes, a memo pad, and document searching as well as viewing and manipulation functions. The package lets users store scanned and electronic documents of different formats in a single folder.

*Paperless Office* employs a number of cross-referencing methods to aid in the search and retrieval of scanned documents, including assigning an ID number and a date and noting the system of origin. Additional features include automatic generation of fax cover sheets, pull-down menus, and mouse support.

**List Price:** *Norick's Paperless Office*, Version 1.0, $249; five-node network version, $495. Norick Software Inc., 5400 NW Grand Blvd., 56#450, Oklahoma City, OK 73112; 800-527-5764, 405-946-7559.

CIRCLE 410 ON READER SERVICE CARD

## Statistical Forecasting Comes to Windows

IMPROVED **Business Forecast Systems** is now shipping a complete revision of its popular DOS-based *Forecast Pro* for the Windows environment. *Forecast Pro for Windows*, Version 1.0, is a statistical forecasting package that uses a rule-based expert system to analyze data and recommend the optimum forecasting technique. The package also offers an explanation of its choice of technique.

Forecasting methods include exponential smoothing models, Box-Jenkins, Dynamic Regression, and methods designed to handle short data sets. Files can be created with *Forecast Pro for Windows*, or data can be imported in from a number of sources including *Excel* and *Lotus 1-2-3*. The package supports DDE (dynamic data exchange) links with other Windows applications. A graphics feature lets users display, print, and adjust variables and forecasts.

***Forecast Pro*'s "peek or poke" utility lets you adjust forecasts by clicking and dragging data points on-screen.**

**List Price:** *Forecast Pro for Windows*, Version 1.0, $595; upgrade from *Forecast Pro*, $199. Business Forecast Systems, 68 Leonard St., Belmont, MA 02178; 617-484-5050.

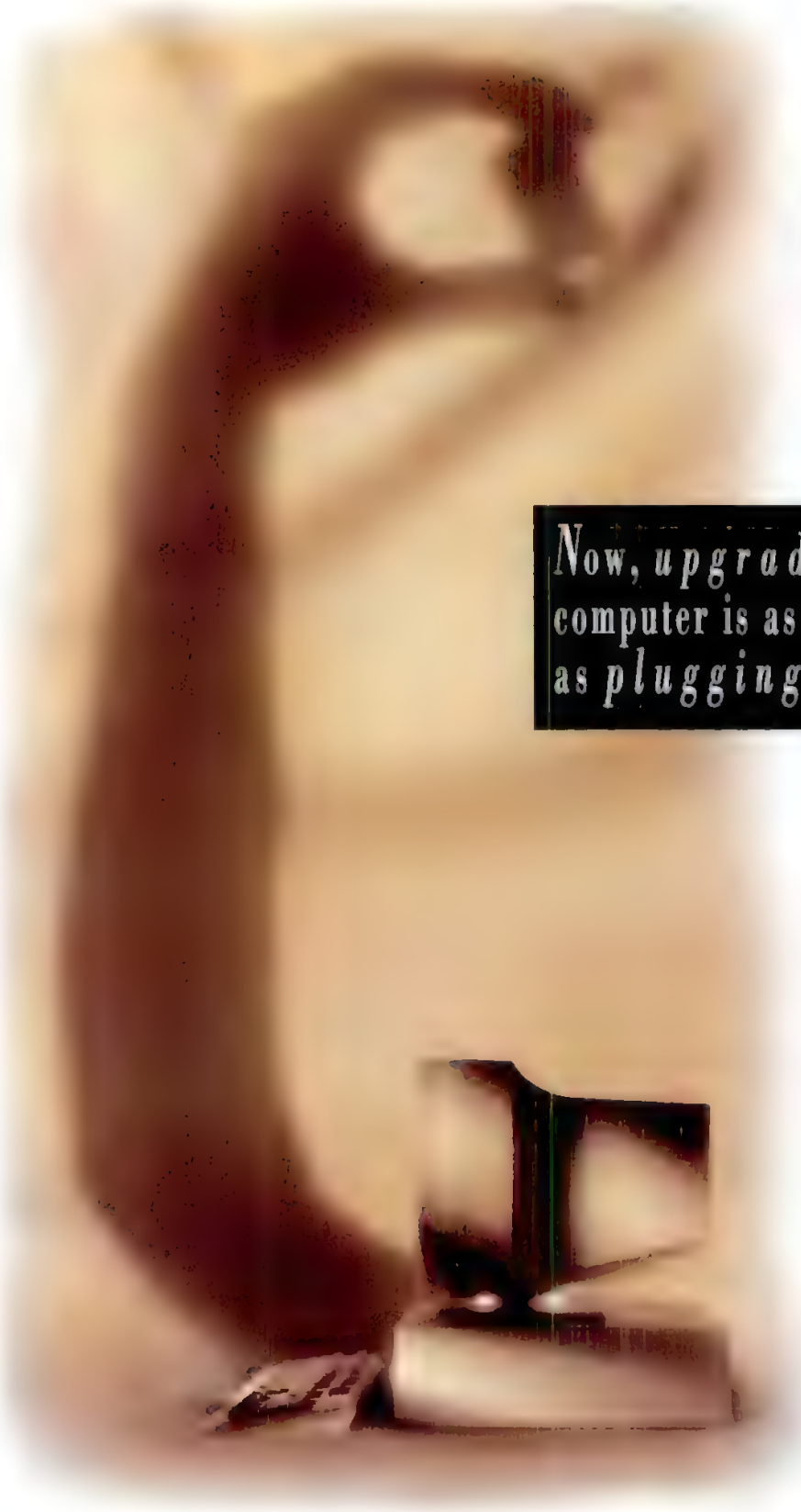
CIRCLE 411 ON READER SERVICE CARD

## Encyclopedia of Science/Technology On CD-ROM

IMPROVED **McGraw-Hill** has unveiled the *McGraw-Hill Science and Technical Reference Set*, Release 2.0, offering coverage of over 75 scientific and technical disciplines in theoretical and applied sciences. The new version includes both new and updated articles, enhanced graphics, and improved search-and-retrieve features.

The set contains the complete and unabridged editions of the *McGraw-Hill Concise Encyclopedia of Science & Technology, 2nd Edition* and the *McGraw-Hill Dictionary of Scientific and Technical Terms, 4th Edition*. A total of 7,700 articles, 117,000 terms and definitions, and 1,700 graphics are accessible through 1.5 million hypertext links, according to the company. A new "Mirror of the Cosmos" menu lets users choose a broad category

CONTINUES ON PAGE 66



**Now, *upgrading* a computer is as simple as *plugging* it in.**

You don't have to replace circuit boards. You don't have to spend an arm and leg for upgrade modules. All you need is two fingers. One microchip.

And an AcerPower™ 386SX or 486SX.

Because Acer has invented something no other computer in the world can give you. A breakthrough technology that makes upgrading a computer dramatically easier than ever. For a lower cost than ever. And it's available off the shelf from dealers everywhere.

We call it ChipUp.™

Take the AcerPower 386SX. It comes out of the box as a 386SX machine. When you're ready to upgrade, just drop in a 486 chip. That's it. The computer does the rest–upgrading itself automatically. Giving you up to five times the power. It's like buying an entirely new, state of the art computer for the price of a single chip.

So why worry that the computer you bought today will be obsolete tomorrow, when it's such a snap to prevent it?

Punch in 1-800-SEE-ACER in the U.S. and Canada and find out how a computer can save you money. Now. And in the future.

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Patents pending for ChipUp technology

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## BRIEFS

CONTINUED FROM PAGE 64

**Computervision** has unveiled new integrated versions of its *Personal Machinist* CAM software that are fully compatible with the company's *Personal Designer CAD* package. *Personal Machinist 2.5-axis*, Version 4.0 ($6,500), is designed to facilitate the milling and turning of parts. *Personal Machinist 3-axis*, Version 4.0 ($10,500), is designed for nurb and Bezier surface machining. 617-275-1800.

**Informative Graphics** is now shipping *MYRIAD for DOS*, Version 1.0 ($395), a multiple format viewing package that can view and plot more than 20 CAD, scanned raster, color raster, and text file formats. The package provides full zooming and panning features and is compatible with a wide variety of output devices. 602-971-6061.

**Information & Graphics Systems** is shipping an updated version of *CADCore/Tracer* bundled with a new hypertext package, *CADCore/PAD*. *CADCore/Tracer*, Version 4.0, offers raster drawing and editing features for the conversion of paper-based maps and documents into CAD format. *CADCore/PAD*'s hypertext capabilities let users establish links between graphics and text. *CADCore/Tracer* with *CADCore/PAD* is priced at $5,550. *CADCore/Tracer* is available separately for $4,500. *CADCore/PAD* cannot be purchased separately. 303-449-1110.

**LANDCADD** is offering a new utility package for *AutoCAD*. *CADpanion*, Version 1.0 ($199.95), provides drafting and layering tools, macros, and a number of symbols, hatch patterns, and tags. 303-688-8160.

**Intel** has unveiled the RapidCAD Engineering CoProcessor ($499), a two-chip coprocessor that can improve the performance of CAD applications running on 386DX-based PCs by as much as 70 percent, according to Intel. The first chip (RapidCAD-1) replaces the system's 386DX CPU and combines the functions of a 386DX processor and a 387 math coprocessor on a single chip. The second chip (RapidCAD-2) plugs into the math coprocessor socket and performs math exceptions. 800-538-3373.

CONTINUED FROM PAGE 64

and navigate down through the various subdisciplines.

**List Price:** *McGraw-Hill Science and Technical Reference Set*, Release 2.0, $495. McGraw-Hill Professional Book Group, 11 West 19th St., New York, NY 10011. 800-262-4729.

CIRCLE 412 ON READER SERVICE CARD

## Transform Your Old 286 with 386 And 486 Upgrade Kits

**NEW** Two companies are offering separate upgrade solutions for Compaq 286-based PCs as well as AST, Everex, and IBM units. **Club American Computers**' Club MBX-III Series upgrade kit offers an upgradable motherboard featuring a 386DX processor running at 25 MHz, with 64K of cache memory. This kit includes all the components and documentation needed to upgrade any PC designed around the standard 286 IBM AT, which has an 8-expansion-slot chassis. Additional kits allow migration up to a 486 processor running at 50 MHz, with 64K of cache memory.

**SuperComputers**' Super SX plug-in upgrade card lets users boost the power of their Compaq and AST 286s to that of a 386SX. The card features an AMD 386SX processor running at 25 MHz. The card provides 16K of cache memory, upgradable to 64K. Options include 2MB, 4MB, and 8MB SIMMs and a math coprocessor.

**List Price:** Club MBX-III Series (386DX/25), $507. Club American Computers Inc., 3401 W. Warren Ave., Fremont, CA 94539; 800-524-2582, 510-683-6688.

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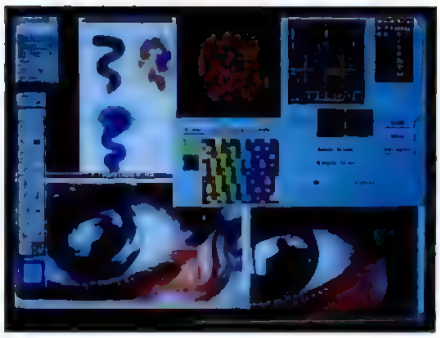
**List Price:** Super SX, $598. SuperComputers Inc., 8575 Willows Rd., Redmond, WA 98052; 206-881-7500.

CIRCLE 414 ON READER SERVICE CARD

## Edit up to 16 32-Bit Color Images Simultaneously

**NEW** **PixoArts Corp.**'s DOS-based *PixoFoto*, Version 1.0, provides 16 zoom levels and 22 tools for editing images in 8-, 16-, 24-, and 32-bit color and 8-bit gray scale. The unique graphical user interface lets users open and work with up to 16 images at one time.

*PixoFoto* offers an airbrush tool, a stamp and clone tool, and custom brushes for creating effects such as charcoal, pastel, watercolor painting, and oil painting. The program surpasses the 16MB memory limitations of Windows 3.0 and can handle image files from 20MB to 64MB, according to the company. *PixoFoto* supports .GIF, .PCX, .TGA, and TIFF. file formats, and imports images from Windows 3.0 and *AutoCAD*.



***PixoFoto*'s satellite window displays an entire image, while the active window allows editing in multiple zoom levels.**

**List Price:** *PixoFoto*, Version 1.0, $895. PixoArts Corp., 4600 Bohannon Dr., #220, Menlo Park, CA 94025; 415-323-6592.

CIRCLE 415 ON READER SERVICE CARD

## File Management And Text Searching For Windows 3.x

**IMPROVED** **Cognitronix**'s *Searcher Professional*, Version 1.1, searches for files and text strings across multiple disks based on filename, size, path, date, file attributes, and text contents. Applications for files can be launched by double-clicking on the filename.

The Windows-based program supports wildcards, multiple file and path specifications, and multiple text strings. File management capabilities include copy, move, delete, sort, and viewing of selected files.

**List Price:** *Searcher Professional*, Version 1.1, $59.95. Cognitronix, 12322 Poway Rd., #120, Poway, CA 92064; 619-549-8955.

CIRCLE 416 ON READER SERVICE CARD

## Epson Unveils Affordable Home-Office Printer

**NEW** At $299.99, **Epson**'s ActionPrinter 3250 is a low-priced, 24-pin dot matrix printer designed to satisfy the needs of the typical home-office user. The 12-pound unit measures 5.1 by 14.8 by 9.9 inches and provides print speeds of up to 200 characters per second in draft mode and 72 cps in letter-quality mode, according to the company.

The ActionPrinter 3250 offers print resolutions up to a maximum of 360-by-360 dpi. The cassette tray holds 50 sheets of paper. An optional tractor-feed attachment and a printer stand that hangs from the side of a desk are available. ■

**List Price:** Epson ActionPrinter 3250, $299.99. Epson America Inc., 20770 Madrona Ave., Torrance, CA 90503; 800-922-8911, 310-782-0770.

CIRCLE 417 ON READER SERVICE CARD

# Now The People Who Pioneered PC Accounting Offer Full-Featured Windows Accounting For Only $99.

At Peachtree, we've been helping small businesses get their accounting done – quickly and easily – for over 16 years. Now we're taking that tradition one step further.

## New Peachtree Accounting for Windows.™ Not Just A Better Program. A Better Value.

Peachtree Accounting for Windows is an exciting new update of Crystal Accounting, the first accounting system to take advantage of Windows.

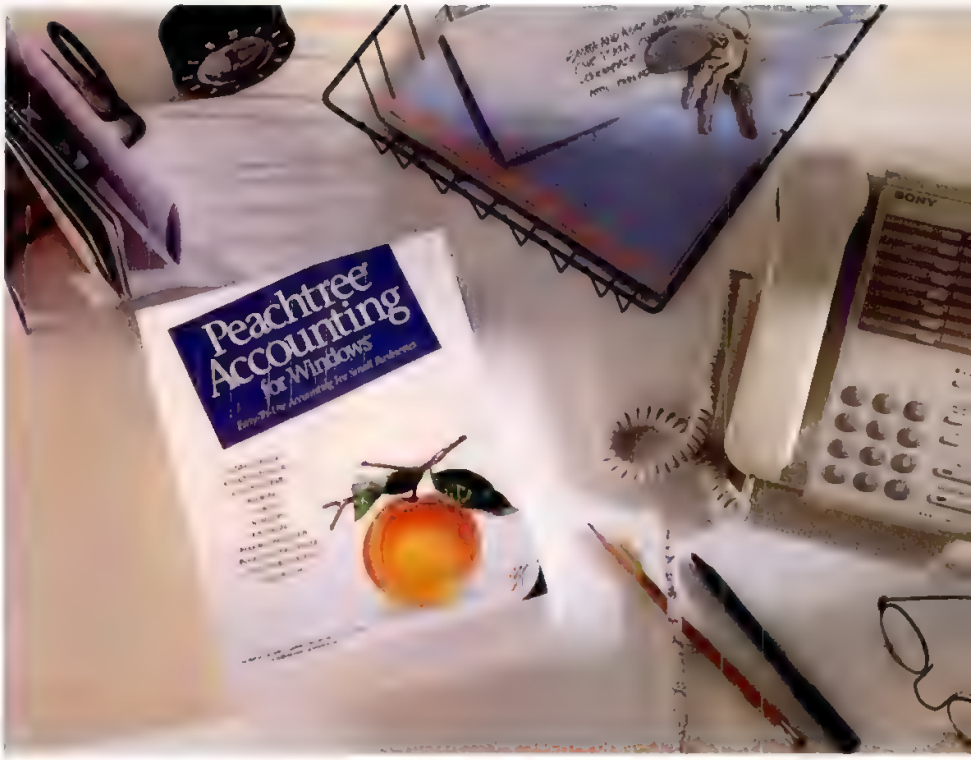
ASK YOUR ACCOUNTANT

It introduces a host of new features that make excellent use of Windows' graphical user interface. Plus, it sports the special price of only $99 – making it by far the best value in Windows accounting.

You'll find all the functions your business needs – General Ledger, Budgeting, Accounts Receivable, Invoicing, Accounts Payable, Payroll, Inventory, Job Costing, and Bank Reconciliation – in one easy-to-use program.

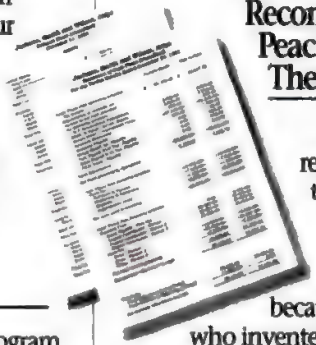
The package includes a Financial Report Writer for customizing your financial statements, and a Custom Forms Generator for designing your own invoices and statements.

On-line help is always available, as well as a complete accounting primer and tutorial. Plus, Accounting for Windows is multi-user capable and fully networkable – right out of the box.




## Rave Reviews.

*PC Week* said our Windows program was "well-designed and well-implemented . . . anyone with limited PC or bookkeeping experience should be able to learn the program quickly." And *PC World* says, "if you're looking for a balance between power and simplicity, this is the program to buy."



## More Accountants Recommend Peachtree To Their Clients.

More accountants recommend Peachtree than any other brand of PC accounting software.

Maybe it's because we're the people who invented PC accounting in the first place. Or because we've sold nearly half a million software packages worldwide. Or because nobody works harder to bring you the best value in accounting software.

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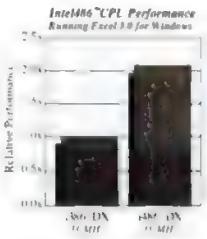
# The affordable power sou

Today's user-friendly software demands a lot of power to really be friendly. And now you can give it the Intel486™ power it needs for a friendly price.

With an Intel486 microprocessor inside, you can take full advantage of today's graphical software. In fact,




where other systems get bogged down, like running multiple Windows* applications simultaneously, the Intel486 CPU powers through these kinds of challenging operations easily.

Plus, the Intel486 CPU will keep

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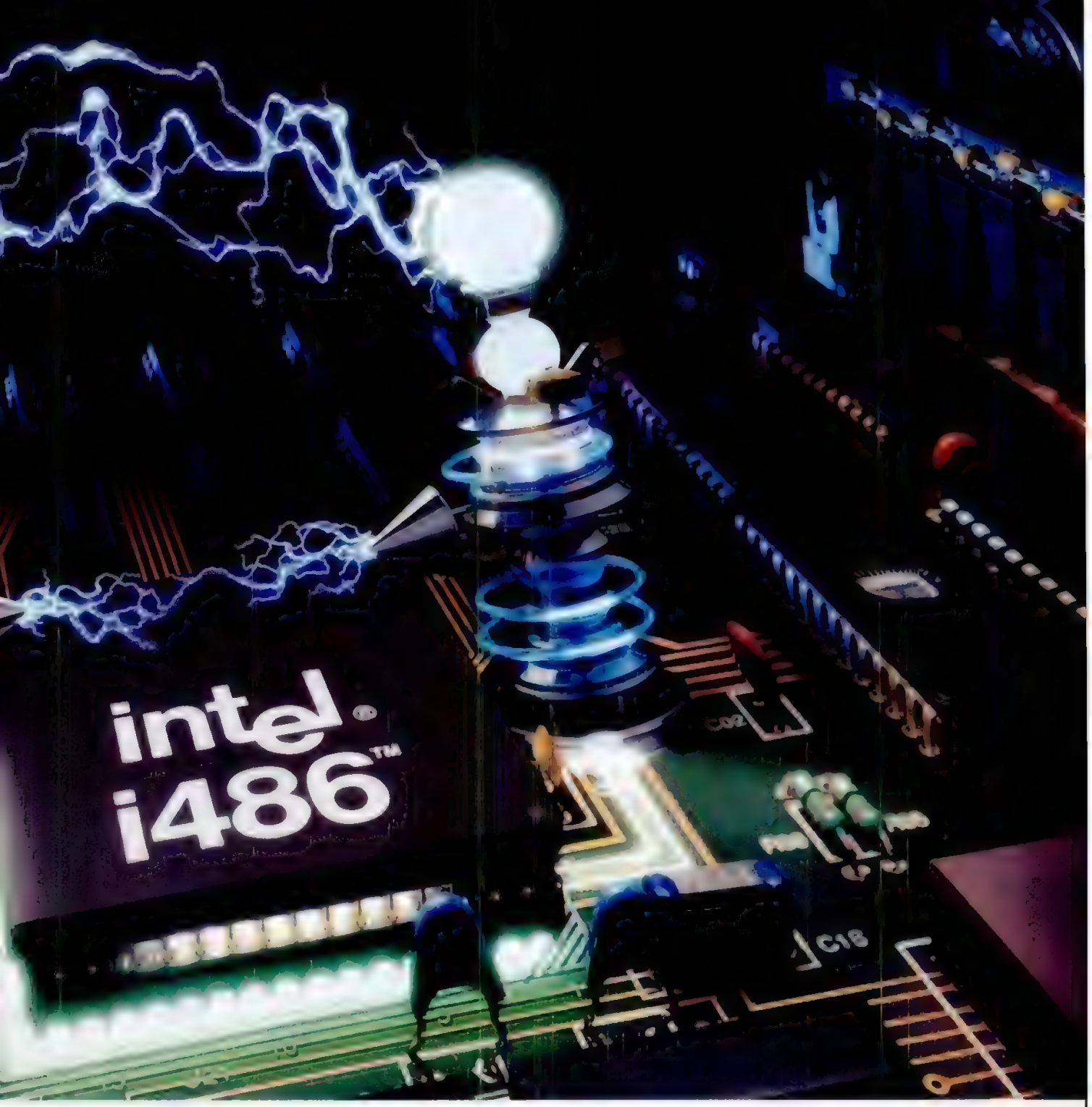
*All product names are trademarks of their respective manufacturers.




# rce for today's software.

generating the power you need beyond today. Because the next generation of operating system software—like Windows NT®, OS/2®, Solaris® and NextStep/486®—also needs the power of the i486 CPU.

Ready to get the most out of your windowing software? Then call (800) 228-4549 for a free brochure on the new standard in desktop computing—the Intel486 family. And plug your software into a real power source.

intel®

The Computer Inside.™

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# Data Compression of course, but

# Which One?

Why not go with the real-time data compression software being used by more PC users worldwide!

Just install SuperStor 2.0 and you instantly increase your disk capacity by 2-3 times! Then use your computer the way you normally do, no extra commands or keystrokes are required.

SuperStor 2.0 provides up to 25% greater compression than before! It's the fastest, most advanced product of its kind, with many unique features that make it more powerful, easier to use, and far more flexible than the competition. Just look at the chart to review SuperStor's numerous features–many of which are not offered by other compression products.

SuperStor 2.0 is not only the most powerful, it's the most user friendly, too! Clear, colorful graphic displays make installing and using SuperStor simple. And, SuperStor 2.0 runs with all popular operating systems and application programs.

So when choosing data compression, SuperStor is the one!

***For more information, please call 1-800-732-3133.***

**addstor**

3905 Bohannon Drive
Menlo Park, CA 94025
Tel: 800-732-3133 ▪ Fax: 415-688-0466

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| Not all data compression products are created equal! | SuperStor New Version 2.0 | Stacker 2.0 |
|---|---|---|
| Compresses hard drives, RAM, floppy, and other removable media by an average ratio of 2:1, doubling your disk capacity! | YES | YES |
| Real-time on the fly data compression doesn't slow down your PC! | YES | YES |
| Universal Data Exchange allows compressed floppies or removable drives to be read and saved by any PC! | YES | NO |
| Fully integrated menu-driven software program offers ease of installation and operation! | YES | NO |
| Advanced Compression Utility Tool Kit scans, checks, and repairs compressed data! | YES | NO |
| Advanced Disk Optimization Utility defragments or consolidates compressed data for optimal disk performance! | YES | NO |
| Highest compression ratio of any data compression software (up to 25% greater with version 2.0!). | YES | NO |
| Automatically updates CONFIG.SYS on physical partition to further enhance transparent operation! | YES | NO |
| Dynamically adjusts drive capacity to fit more data on compressed disks with less effort! | YES | NO |
| Performance enhancing Disk Cache results in faster system performance! | YES | YES |
| Device driver easily loads high, maximizing conventional memory for RAM-intensive applications! | YES | YES |

CIRCLE 096 ON READER SERVICE CARD

by
Carol Levin

# Read Only

*Reviews of the Latest Books for the PC User*

## Communications Guide Clears The View from Your PC's Serial Port

After you've lost the manual to your communications software and your patience with just about everything on-line, keep Philip L. Becker's *Introduction to PC Communications* close at hand. Covering both hardware and software, and stretching from simple e-mail and comm software to the most complex multinational corporate setups, this book touches on most of the highlights of viewing the world from your PC's serial port.

Becker is an on-line veteran. He is the creator of *TBBS*, a popular bulletin board software package; he sees a lot of examples of how not to go on-line, and he clearly knows his stuff.

A hybrid reference/history text, *PC Communications* is well structured. Each section opens with a history of the technology in question and then steps through the details of setup and operation. Experienced users can use the book to brush up on basic concepts such as modems and viruses and then move on to advanced topics such as internetworking and running one's own BBS. And though power users will want to flip past yet another explanation of how bits are like 1s and 0s, the book's scope guarantees that no reader will automatically be fully knowledgeable about all the areas covered.

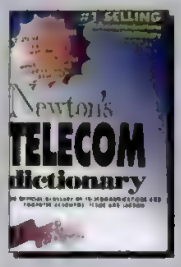
Becker wisely stays away from trying to give a sweeping overview of the market. Instead, he concentrates on helping readers sort out their individual needs. Newer users will probably appreciate the chance to read up on the popular on-line services (such as CompuServe and Prodigy) without blowing bucks on a membership or stumbling around aimlessly in the ether.

For those ready to go on-line, *PC Communications* is packaged with *ProComm Lite*, a bare-bones version of the market-leading comm software. Even with two top comm packages somehow connected with his book, Becker's tips for selecting software are fair-minded and extensive. And for those who use their modems well but not safely, a chapter offers tips on detecting and surviving viruses.

Reference books stand or fall by the extent of their "I need it now" features, and Becker includes all the expected reference lists and glossaries, plus a Modem Troubleshooting Guide. (Inexplicably, this falls within the body of the book and not among the appendices. In my copy, a little bookmark permanently locates the section.) This guide succinctly answers questions about the most common modem screw-ups—without that exasperated sigh you hear from the guys in tech support.—*Angela Gunn*

***Introduction to PC Communications***
by Philip L. Becker, $24.95, Que (Prentice Hall Computer Publishing), 11711 N. College Ave., Carmel, IN 46032; 800-428-5331.
ISBN: 0-88022-747-8.
CIRCLE 476 ON READER SERVICE CARD

## Newton's Telecom Dictionary: Essential Resource Expanded for 1992




Although it's been only a year since the previous release of this classic guide, the new, fourth edition of *Newton's Telecom Dictionary* is expanded by 35 percent (Telecom Library Inc., $19.95, 800-542-7279, 212-691-8215) with fortified coverage of ISDN and open architecture. Explaining connections between PCs and telecommunications in clear, nontechnical language, *Newton's* adds a few idiosyncratic touches and a healthy dose of history. Fun to browse, too.—*AG*

## CompuServe Roadmap Helps Chart Your Course—Before You Type GO

CompuServe, the premier on-line service, now reaches more than 800,000 subscribers and provides more than 200 forums and 1,400 databases. Its explosive growth makes the need for a comprehensive reference critical, but the electronic on-line world of CompuServe changes so fast that the shelf life of any such reference is limited. While Charles Bowen's *CompuServe from A to Z* is no exception, it is still a very good and accessible reference that won't leave you stumbling through CompuServe's vast universe.

The book features short descriptions for most offerings and longer entries for the larger, more popular services such as the IQuest gateway (to some 900 databases) and PC MagNet. How many topics are covered? Plenty. Services such as IQuest and Computer Database Plus, and forums on subjects from animation to world affairs, are all here. Look up *desktop publishing* and you'll be directed to a number of places where it is discussed. Under *IBM* there's a lengthy discussion of IBMNET—how to find it, what you can find there, and who runs it. CompuServe addresses for major forum sysops are also included.

*CompuServe from A to Z* is also well suited to on-line newcomers looking for quick answers to the basics and directions on getting help, both on-line and off. Refer to *CompuServe from A to Z* before you go on-line and when you're ready to connect, you'll know exactly where to find whatever you need. The best advice is to buy the book fast, while it's still up to date.—*Rick Ayre*

***CompuServe from A to Z***
by Charles Bowen, $24.95, Bantam Computer Books, 666 Fifth Ave., New York, NY 10103; 800-223-6834 ext. 9479, 212-492-9479.
ISBN: 0-553-35461-2.
CIRCLE 477 ON READER SERVICE CARD

# Here's Dataworld's new 486/33 Mini-Laptop...

Finally, a battery-operated mini-laptop with the power you need for Windows 3.0, CAD/CAM and other advanced applications!

## True Windows' Power

The LP433's 1000% brighter contrast and 350% wider viewing angle will enable you to see the fine graphic detail required to maximize your Windows 3.0 computing tasks! You'll find using Windows easier and faster than ever!

The rapid screen refresh-rate of the LP433's gas-plasma display lets you move your cursor as fast as you want without it disappearing.

## CAD/CAM Users, Lotus 1-2-3 Users, Data Base Users

The combination of the LP433's 33Mhz CPU and its built-in math coprocessor yield the dynamic number-crunching power you need—there is nothing else to buy! From redrawing on-screen graphics, to indexing super-large data bases or living in the multitasking world of Windows 3.0—the LP433 is your solution!

**For simultaneous VGA presentations**—the LP433 is ready for your external color monitor and 101 keyboard.

## Data LP433
**486DX-33 Mini-Laptop**

**$3495.**

Gas Plasma VGA • 2 MB RAM, Exp. to 6 or 10MB
8K internal RAM cache & numeric coprocessor (in CPU)
Ext. 1024x768 Video Adapter with 512K
80MB HD—160MB Cap. w/Stacker™ Software
1.44MB 3.5" FDD • MS-DOS 5.0
Built-in half-length card slot • $738 Software Bundle
9.6 lbs (11.5 with battery) • 12.5"Wx12.5"Dx2.7"H
Removable NICAD 2 hr Battery with AC Adapter

*— FCC B Approved —*

# And, Dataworld's new 25Mhz 386SXL—with 2MB RAM & an 80MB hard disk!

Now the highly-rated Dataworld NB320 is even better! We've added the latest 25Mhz SXL CPU—boosting the total performance speed by 25%! And, we've *quadrupled* the size of the hard disk to an impressive **80MB**!

Dataworld's NB325 measures *down* to the right 8.5"x11" size (and a *light* 6.9lbs)—just right for your briefcase! It also boasts an expansion box **port**.

"A solid, complete machine that sets the standard for the rest of the industry."
— Computer Shopper Magazine

## It's Expandable, Too!

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## dBASE Guide Offers Training Ground for Would-be Programmers

Aimed squarely at programmers-to-be, *Liskin's dBASE IV 1.1 Programming Book* takes novice users step by step through the development of database applications. This mammoth 1,300 page book is the most comprehensive introduction to *dBASE* programming currently available.

Author Miriam Liskin structures her book to follow the process of designing, implementing, debugging, refining, maintaining, and enhancing a typical business application. The formula works well.

*Liskin's dBASE IV 1.1 Programming Book* centers around a case study of a fictional company, National Widgets Inc., a supplier of PC accessory products. Liskin starts her instruction by prototyping a business application—portraying the details of the fictional company and its operations as they exist prior to automating. You quickly learn about National Widgets' employees and customers, how its customers place orders, and how its manual accounting system works. You find out everything you need to computerize the fictional company successfully.

The rest of the book draws on this information as the basis for a customer tracking and accounts receivable application. From Liskin's clear instructions, you'll learn how to document system requirements, prepare the initial design, and create the system, all the while learning a lot about programming *dBASE*.

*Liskin's dBASE IV 1.1 Programming Book* proceeds in order of increasing complexity. First come *dBASE IV*'s built-in tools, such as the applications generator, covered in part 1, "Application Design and Prototyping"; this is followed by lessons explaining data files in part 2 and complete standalone program development in parts 3 and 4.

Liskin is patient. While it would be easy for the author to move swiftly through program development, instead she keeps a level pace and provides complete explanations that teach the many facets of *dBASE IV*. And she's thorough: All the important bases are examined, from working at the dot prompt to creating data entry forms and accessing multiple files.

The final section of *Liskin's dBASE IV 1.1 Programming Book*, "Refining and Optimizing the Application," covers advanced topics such as security, system maintenance, and multiuser programming. There's a chapter on writing more efficient code, which can help you choose the best of *dBASE IV*'s many ways of approaching a task. And a chapter on debugging offers a conscientious approach to quality assurance.

Rich with examples and details yet friendly and conversational in tone, this volume will help you develop skill even if you are not a programmer but are willing to explore. Whether you need expert advice or detailed instruction, this is the book for programming *dBASE IV*.—*Sal Ricciardi* ■

***Liskin's dBASE IV 1.1 Programming Book***
by Miriam Liskin, $34.95, Osborne/McGraw-Hill, 2600 Tenth St., Berkeley, CA 94710; 800-227-0900. ISBN: 0-07-881681-5.
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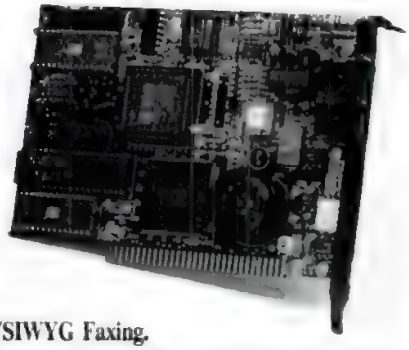

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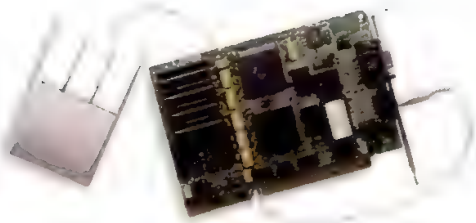

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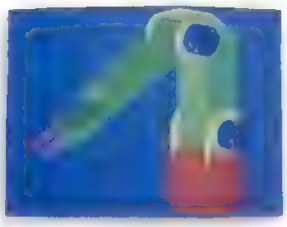

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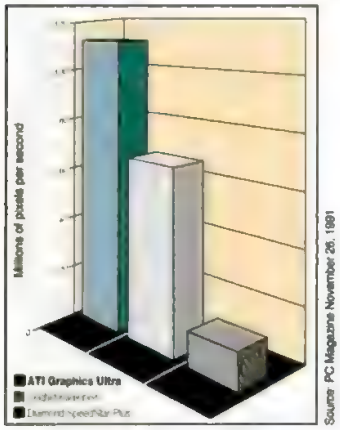


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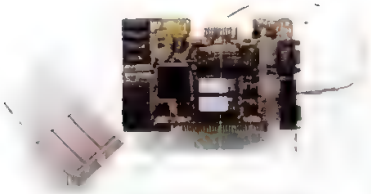

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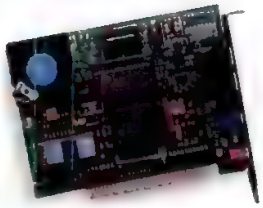

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edited by
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## APro Brings Robust Communications Functionality to Your TP Programs

Getting a communications program to work correctly is difficult and confusing. The same was always true of writing one, until now. Async Professional (or APro), Version 1.02, is a communications library that does all that can be done to make the process as painless as possible.

Where a lot of communications libraries do nothing more than group together some heterogeneous functions, a good library does much more than that. It provides code for the features a programmer needs to include in a program, it offers the features in a package that makes them accessible, and it is well designed so that a programmer can build a robust application.

APro, from TurboPower Software, lives up to these expectations. The code for ANSI terminal emulation is provided. File-transfer protocols include everything from old standbys, such as Xmodem and Kermit, to support for Zmodem and CompuServe-B for the packet network programmers. It even includes code that can detect whether the computer being used has a 16550 UART and, if it does, will turn on the 16-byte FIFO buffer and use it.

But these are the features that a communications library *should* have. In true TurboPower tradition, APro moves well beyond what's expected to what's best described as feature-rich. There is code to compress and extract files using the LZH algorithms used in the popular program *LHARC*. There is even sample code that shows you how to write a viewer to look at the contents of both LZH and ZIP archives.

The features in APro are implemented both as a collection of standalone procedures and as a hierarchy of communications objects. This means you can take advantage of Turbo Pascal's object extensions if you wish, but lose no functionality if you should choose otherwise. When you install APro, you can choose both the functions and the object library, or just the code that suits your programming style. The procedural code takes up about 2.5MB, with sample programs, and the OOP code a little more than 3MB. Full source code is included.

APro is also a well-conceived and well-designed tool set, giving you access to serial communications at all levels. At the very low (or hardware) level, APro provides INT 14h replacements; at the middle level, it gives code to hook features such as file-transfer protocols; and at the high level, it provides code that lets you write your own communications program.

The code in APro, even the non-OOP functions, is put together in a way characteristic of object-oriented design. At its highest level, the abstract layer, APPORT, contains only the abstract data and procedural definitions. The middle-level code, or *interface layer*, accesses the device layer or APUART, which is the low-level code. It does this using functions like GetChar, which returns one received character from the port.

APro is designed to interface seamlessly with TurboPower's Object Professional Pascal library, which is about the best interface-level code you're likely to find in a programming library.

Finally, the device layer supports both direct calls to APUART and calls to INT 14. "Wait a minute," you say? "Didn't you just imply that INT 14 wasn't suitable for today's communications programs? Now you tell us that there is code to use it?"

Well, there are some specific instances when you might have to use INT 14 calls in your communications program. The best example of this is when your program is running on a network with shared modems. In this case, to know when you want to use one of the shared modems, the network operating system monitors INT 14 calls. So you need to support INT 14 calls if you want your communications program to work with certain networks. TurboPower knows how programmers use communications software, and its support of INT 14 is a good example of how this shows up.

> APro is a well-conceived tool set, giving you access to serial communications at all levels.

There are just a couple of complaints I'd like to register with the TurboPower folk. The first is that this library is written exclusively for Pascal programmers. It does put to rest the claim made in some circles that you must use C to write a good communications program. It is quite ironic that the best communications library sold today (and make no mistake, APro is the best) is written for Pascal. Nevertheless, it's a shame that only Pascal programmers can benefit from such a good product.

The second complaint is about APro's documentation. If you have other TurboPower products, you may be acclimated to this kind of manual—or at least know what to expect. The manual is very dense. While this style makes a good reference, it doesn't make a very good user's guide. APro needs both. The POPHelp program is of some assistance, but it is no replacement for documentation.

TurboPower is famous for support, and the support for APro meets high standards. Phone support is free (although you pay for the call), but the company's section on CompuServe, in PCVENB, is the best place to ask questions and get prompt answers. If you use CompuServe or Ziff-Net and would like to look at what can be done with APro, check out Steve Sneed's (of TurboPower) excellent CompuServe program, OZCIS. It is available to be downloaded from the IBMCOM Forum, Library 9. Look for four files, OZCIS1.ZIP through OZCIS4.ZIP. Aside from the download cost, it's free.

*—Rick Ayre*

**Async Professional, Version 1.02**
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Background Information 1 _____

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## REFERENCES

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Phone _____ Name of Bank Officer _____ Account No. _____

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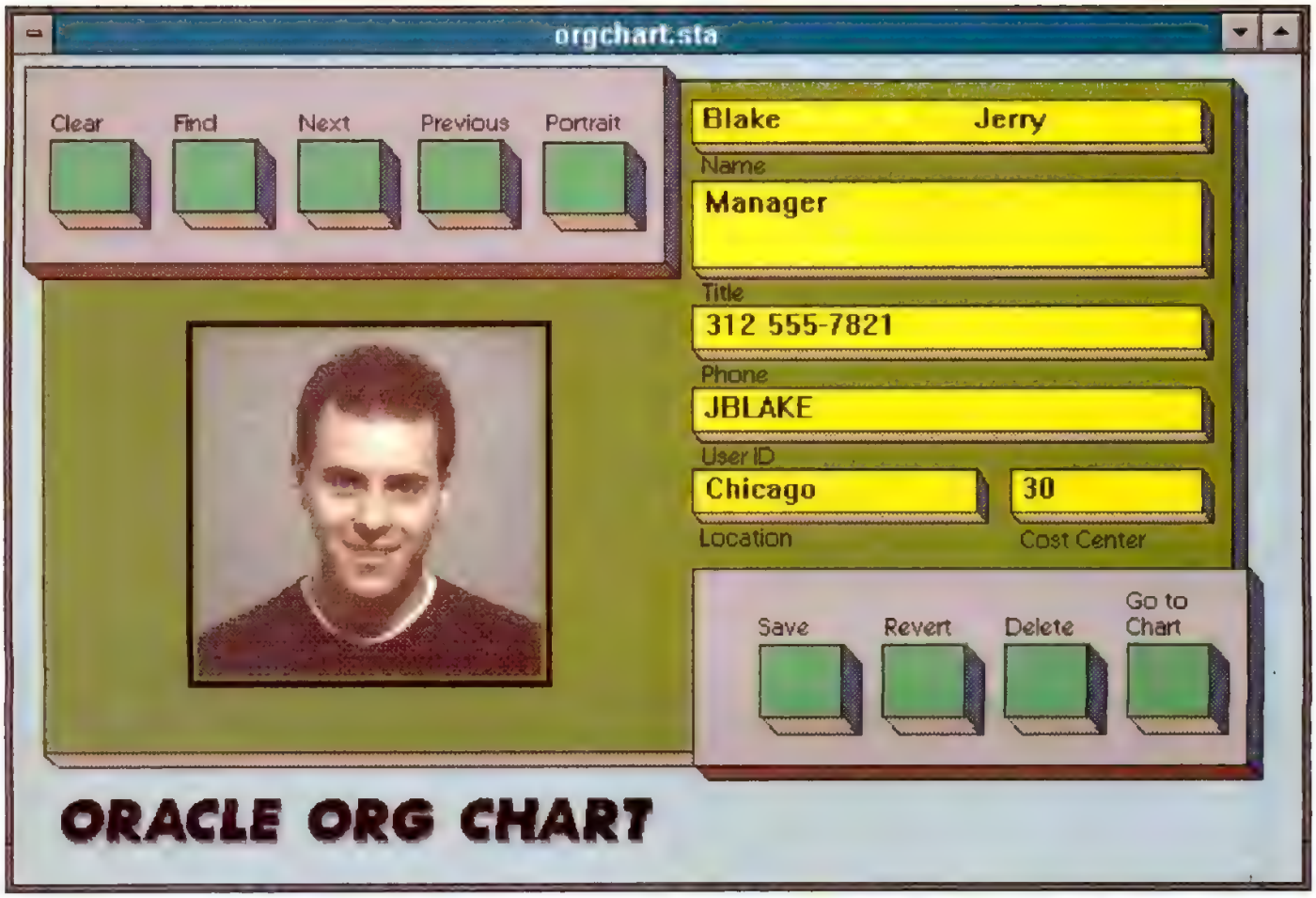

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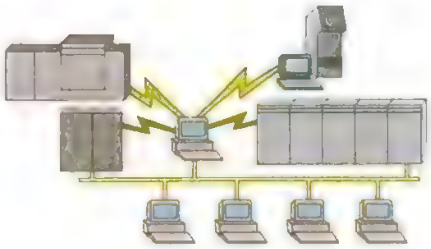

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# Michael J. Miller

# Format-Free Data

**For PC productivity to increase any further, proprietary file formats have got to go.**

No man is an island. Neither is an application.

Computer users are moving further and further away from the old model of one person running one program on one machine. We're entering a new world of multitasking operating environments, networked applications, and tools that can be shared between applications. But before this migration is complete, one other thing must change. Applications must become more independent from the file formats they use for storing information.

Historically, whenever a manufacturer developed a new application, it also introduced a new file format. This made sense when there weren't many programs out and as programs started to store more kinds of information. As all this data was recorded in one format or another, programs added import and export features.

However, even in the categories that traditionally offer file import and export, such as word processing and spreadsheets, those features are often quite limited. You can import word processing text and spreadsheet values from another application quite well, but you'll generally lose much of the formatting. It's even worse in other categories: Have you ever tried to move data between CAD programs, project managers, or personal information managers? If you achieve any success at all, it usually involves intermediate steps and file formats as well as a resulting loss of information.

There has to be a better way. We've already seen applications that work directly with data stored in the file format of some other application. For instance, both *FoxPro* and *Alpha Four* use *dBASE*'s .DBF file format. But this is unusual in other product categories, and it is unlikely to happen there anytime soon.

One quick solution is for all the vendors to make their file formats public. True, vendors would lose any proprietary advantage inherent in their file formats. As users, however, we must make it clear to vendors that our data is more valuable to us than their convenience. We shouldn't have to put up with lost information anymore.

If vendors don't want to share their file format information directly with the competition, some third-party group could fill this need. Recently, the Windows and OS/2 Presentation Manager Developer's Association (WPMA) sponsored a conference to discuss data exchange. I'd like to see a common API for import/export come from these discussions.

### DATA FOR EVERYONE

In the long run, the best approach to managing data may be a more dramatic split between the parts of an application a user sees and the way that application stores its data. This is crucial when many people, each with different needs, share the same data across a network.

That's where the client/server computing model, with its inherent separation of user interface from data, becomes even more attractive. In client/server applications, the data is generally maintained and stored in a central database "back end" that is optimized for that purpose. Individual users can access that data through a variety of front ends—packages designed for accessing and manipulating the centrally stored data. Theoretically, you could have literally dozens of different tools querying the same database of information.

***R:BASE, Alpha Four,* and *Q&A* all work well with .DBF files. Why can't more software share the same files?**

For instance, you might have an *Oracle* server running on *NetWare* connected to a DB2

database on a mainframe somewhere, or a *SQL Server* database on an OS/2 server shared by a workgroup. Clerks might enter records through an application developed in a traditional programming language or database, or in a front-end tool like *ObjectVision* or *Oracle Card*. Inventory could access the information through a database like *Paradox* or *dBASE* while Finance views the same numbers through a spreadsheet package like *1-2-3* or *Excel*. Management could see the result through an executive information system such as *Forest & Trees* or *Info Alliance*.

The advantage in this method of handling data is clear: Everyone can use the tool best suited to what he or she is trying to do, without corrupting the data or impacting the work of others, because the user interface program remains separate from the stored data.

There's no reason why this kind of thinking should be limited to data that is stored as fields and records, either. It's appropriate for shared spreadsheets or graphics images, too. I would like to see it applied to electronic mail. In most cases, a system administrator chooses an e-mail package. Once an organization standardizes on the package, everyone is then forced into using that program to send and receive mail.

Why? Some people may like an interface that others don't. Many people may not even need a separate electronic-mail interface. They would like to stay in their word processor or spreadsheet and still get their messages.

We're beginning to see some steps in the right direction. Some applications use the MHS (Message Handling System) engine that comes with *NetWare*. This lets you access your MHS mail from a variety of applications, such as *BeyondMail* or the mail portion of *Professional Write Plus*. But this only works if you've chosen MHS as your mail system.

Similarly, Lotus has put mail access features in *Ami Pro* and *1-2-3 for Windows*, but you can only use these features if you use *cc:Mail* or *Notes*. You can use gateways between the various mail servers, but that's a decision usually up to administrators, not end users.

I'd like to see electronic-mail front ends that can access a variety of "back-end" mail processors. Such a product might be an e-mail package that could access *cc:Mail*, *Microsoft Mail*, and MHS. In fact, it should be able to access external services, such as CompuServe and MCI Mail, too. It may not even look like an e-mail package. You might prefer these features in your word processor, or in your spreadsheet, or in some other application.

Whether it's electronic mail, databases, or anything else, one thing is clear. There's no program and no single user interface that's right for everybody. Some individuals always want—and should be able to have—their own choices in applications. That way, they can choose the programs they know best or the ones best suited for their needs. For this to work with shared data, we have to retire the notion that each application needs its own proprietary data format. We need more choices in how we will access this data.

"One size fits all" rarely works in clothing. It's even worse for software. ■

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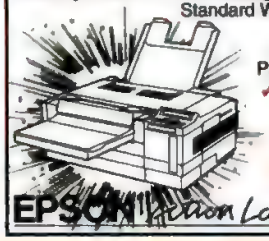


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# Bill Machrone

# Pens Are Promising, But Ink Stinks!

**Pen-based notebooks are finally shipping. They're okay, but I want more.**

Pens are upon us, but they pine for perfection.

The promise of pens is predicated on perfection of character recognition. Instead, we get *ink* as a data type. Every once in a while somebody coins a phrase that seems to stick. In the area of pen-based computing, "ink" is what you see on the LCD screen as your pen/stylus glides over it. The designers of the hardware and software have worked hard and long to make this feedback system responsive. The passing of the stylus point across the display turns on the right pixel among the 300,000 surrounding it (on a VGA screen). This darkened trail of lines, loops, and scribbles is, appropriately, called ink.

To create this effect, the hardware and operating system also know how fast you're moving the pen, in which direction, and in some cases how hard you're pressing. This is vital information to the character recognition software, which turns your scrawlings into ASCII characters that your application software can deal with and your coworkers can read.

These pixilated peregrinations of your pen are shown in excruciating detail on the screen, and they are a challenge to even the best recognition software. The truth is that the human hand is actually pretty unsteady when it writes, subject to hundreds of microtremors of the muscles in your fingers, hand, and arm. The friction of a normal pen or pencil on paper masks the quivers, as do the thickness of the line and the tendency of ink to wick into the paper. Compare this with the slick surface of the LCD screen and the smooth tip of the stylus and you find that your first experience of writing on a pen-based machine is as treacherous as traversing an icy sidewalk in leather-soled shoes. It's a small miracle—and a large testimony to the programmer's art—that these notebooks can actually turn your quavery scratchings into text.

No matter what the manufacturer claims about software that learns to read your printing (cursive handwriting is still out of the question), the machine is actually training you to print in ways that it can understand. For instance, you typically have to pick up the stylus from the tablet surface completely in order for the recognition software to understand that you've ended a letter. The result is unnatural but tolerable—as long as writing speed isn't the issue. When you go fast and start to scrawl, the recognition rate goes right down the drain.

### THE INK COP-OUT

The pen-based pundits have tried to convince me on numerous occasions that what people really want is ink as a data type. Translated, that means that you want to capture the scribblings exactly as your pen makes them. The theory goes that you would, say, take your pen-based system to a meeting and carefully record the date, whom you were meeting with, and the subject of the meeting, so that the machine could recognize the characters and store and retrieve them as data. So far so good. Now you open up a window in which the ink is recorded as data. Then you're free to scrawl and scribble away sloppily without having to care about your writing being recognized. You have effectively disabled the process.

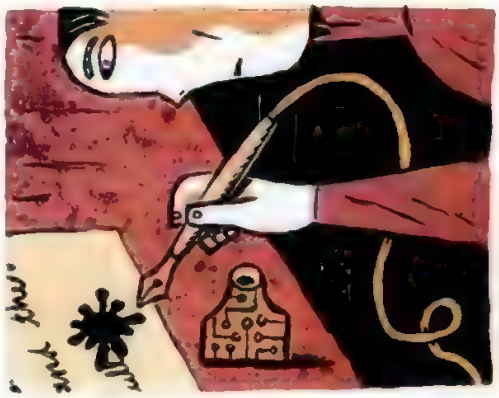

ILLUSTRATION: AD McCAULEY

It's true that the human mind is infinitely superior to machines when it comes to pattern recognition. You'll be able to read abbreviations and mangled words far better than machines for years to come. It's a good thing, too. Because never will your handwriting have looked worse.

My biggest objection to ink as a data type, however, is that it turns the pen-based computer into a $4,000 Etch A Sketch. Nobody wants an overpriced toy, especially when its existence is a tacit admission of the shortcom-

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ings of character recognition technology.

I hope I haven't given you the impression that I'm anti-pen. There are some good, natural applications: Reporting, as by an insurance adjuster. Forms completion, as with inventory. One-handed, standup data acquisition, as with medical records.

The best pen-based application is probably the pen spreadsheet, though. From a character recognition standpoint, numbers are a special case. There are only so many numbers, and their form is generally simpler than that of letters. Therefore, the recognition rate is several times higher than it is for letters. So sure, you could imagine a pen version of *Lotus 1-2-3*, and it would be easy to use, but you'd be settling for far less than the state of the art.

**THE KILLER INK APP**

Dan Bricklin, the guy who invented the original spreadsheet, *VisiCalc*, is at it again. This time, he and his cohorts at Slate Computer have come up with the killer application for pen-based computers. Apart from the inherent unnaturalness of writing on a piece of glass with a piece of plastic, the pen-based spreadsheet blows *1-2-3*, *Microsoft Excel*, and *Quattro Pro* into the weeds.

You write a bunch of numbers. It recognizes them and arranges them in rows and columns. You write a plus sign at the bottom of one of the columns. It sums them—bam. You draw a line through a number you don't want anymore. It's gone. You highlight a number you want to move elsewhere and draw an arrow. It's there. This is the proof of the concept that will revolutionize handheld devices. The buttons on your calculator are history. They're gone. All it takes from here on is time, engineering, and bringing the cost down to reasonable levels. I for one can't wait.

I apologize for the preceding plethora of pen plosives, but at least I've passed over the pen puns. If alliteration were a crime, I suppose I'd be drawn and quartered. But I might as well be hung for a sheep as a lamb, so here goes: A *PC Magazine* T-shirt to the first person who tells me via MCI Mail (WMachrone) or PC MagNet (72241,15) the source and the speaker of this line: "Penny Pingleton, you're permanently punished! Even after you're dead!" ■

PC MAGAZINE EDITORS' CHOICE AWARD

IDEK

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PC MAGAZINE EDITORS' CHOICE
March 26, 1991
Idek MF-5117

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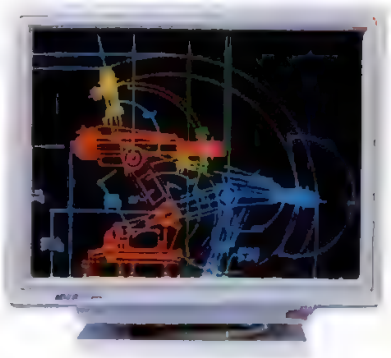

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| MF-5217 | 30 to 57kHz | 0.28 | 1024 × 768 |
| MF-5317 | 30 to 65kHz | 0.28 | 1280 × 1024 |

**MULTIFLAT Series (21" Flat CRT Monitors)**

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| MF-5121 | 21 to 50kHz | 0.31 | 1024 × 768 |
| MF-5221A | 30 to 80kHz | 0.31 | 1280 × 1280 |
| MF-5321A (A/R Panel) | 30 to 80kHz | 0.31 | 1280 × 1280 |
| MF-5421A (A/R Panel) | 30 to 80kHz | 0.26 | 1600 × 1280 |

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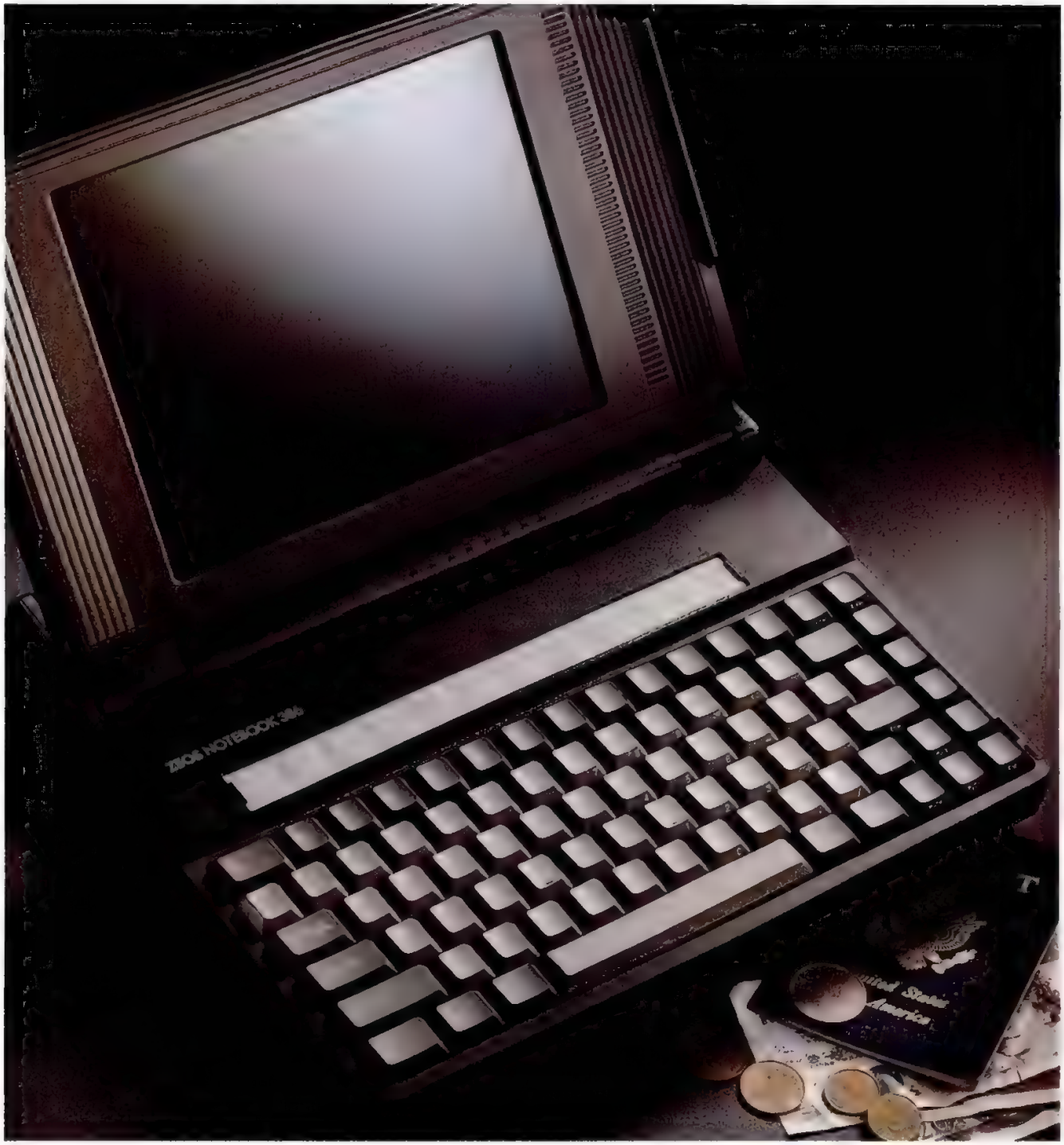

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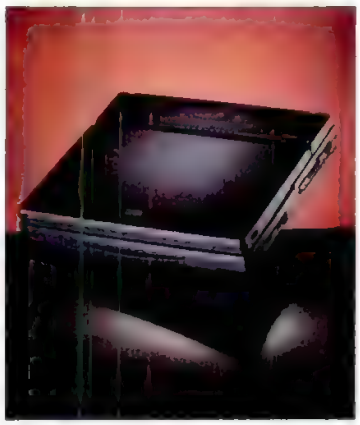

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# John C. Dvorak

# The Death of Traditional Retailing

**The phenomenal success of superstores spells doom for heavy-handed, know-nothing PC salesmen across the country.**

The computer superstore phenomenon is now international, with a slew of them opening up in England and elsewhere. Sales at superstores in the U.S. alone were about $1.5 billion in 1990 and doubled to $3.1 billion in 1991. 1992 figures are expected to hit $6 billion. Where the heck is all this new demand coming from?

Everyone is getting into the act. A new company, LDI, has been opening superstores in the East and Midwest. CompuAdd has stores all over the country. BizMart has over 70 superstores, and Arche Computer is opening some in Europe. Then there's Tandy, CompUSA, and PC World (another U.K. chain). I could go on. Everywhere you go, new ones are opening. A recent report about the Seattle retail situation is typical. The city has more than 200 computer resellers and value-added resellers. So Tandy has targeted it for one of its new superstores at the same time BizMart opened two new stores there.

What is driving this boom? And when will it end? Come on, it can't go on like this forever. While a sustained market doesn't surprise me, this doubling and redoubling requires analysis. Well, the explanation for the phenomenon is obvious.

The failure of traditional "we sell solutions" full-service, full-price retailers (such as Computerland) is providing the business for these new superstores. As the traditional retailers go belly-up, the superstores move in. Seattle, for instance, is a target of superstores because they see all those old-fashioned retailers around town. Easy pickings.

As I watch this bubble expand, I recall how my local Computerland went broke just a few years ago. Gee, talk about lost opportunity. I guess I should reminisce about the old *BYTE* shops, too. There's another flop.

The traditional computer-retailer model is not that far removed from crappy U.S. car dealerships. You know, where the guy selling you the car has to keep going to his "manager" to approve a price. He keeps asking you what he has to do to get you to buy. It's a passé style of salesmanship that is, frankly, sickening. You just want to slap these guys.

Computerland at its best was never much better than a car dealership, but it used a tag-team variation of selling, closer to what is practiced in stereo stores: "I'm going to turn you over to Fred, who will continue to help you." In the worst-case scenario you get a progression of annoying jerks who become more and more insulting until you buy or leave. Modern salesmanship at its worse: Intimidate the lowly customer into making a purchase. How noble.

The success of the superstore phenomenon proves that the public *hates* traditional retailers and their sales techniques. Let's face it, no matter how charming, the cap-toothed, glad-handing, know-nothing salesman is largely despised. It's no coincidence that people buy direct or through mail order in droves rather than dealing with traditional hard-sell retailers.

The American public also hates the notion of bickering over price. This is not Mexico or Iran, where bargaining is a tradition. Americans want a firm price. We comparison-shop for the best price; we don't want to bargain. When you bargain with someone you always feel that you got gypped. Well, you probably did. Why should what you pay be any different from what someone else would pay there?

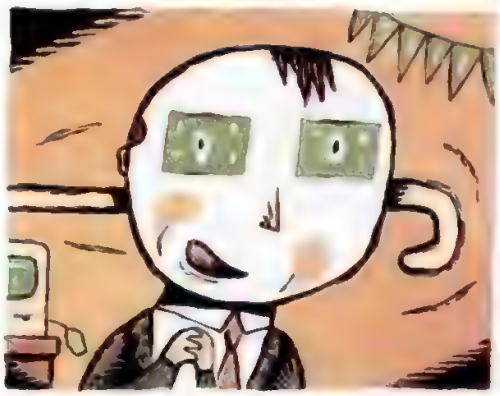

ILLUSTRATION: AD McCAULEY

So the superstore bubble may someday burst. But in the meantime, it continues to grow, not because of some new demand but because people, when given the chance, will flock away from the old-fashioned system of hard sell and intimidation.

I'm cheering. ■

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John C.
# Dvorak

# Inside Track

Has Intel given up the ghost? According to published reports, Intel says that the P5 (known to you and me as the 586) will be the **end of the line** for the 80*x*86 line of microprocessors. This **contradicts** various presentations Intel once made promoting an **80786** design.

I guess this is the only way that Intel can ditch the makers of clone chips. It's also possible that Intel's basic design philosophy just **ran out of steam** and that Intel will now hedge toward RISC. People who have looked at the 586 say that it's **loaded with RISC** design already. This is in addition to two on-chip caches and integrated advanced memory management.

The effect of this announcement is that corporations will have to rethink their buying plans. Many of us expected the 80386 architecture to take us to the year 2000. The discontinuance may actually **hurt Intel** if customers who buy the 586 believe that they will **hit a dead end.**

Well, **don't panic.** The 386 is too important to ignore in future designs, and I suspect a **386 will be part** of any future Intel microprocessor. Why not? Just dedicate a piece of the wafer to a dinky 386. It can't cost much. Furthermore, all the 386 cloners will keep selling 386-based systems and keep the chip alive.

**New Version Dept.:** Look for **33-MHz 386SX** chips **from both Intel and AMD** in the **next few weeks.** These will be inexpensive and should become the standard for low-end computing for the next couple of years. Also note that Intel and others are expected to go completely to a plastic surface-mount package, which will further lower the prices.

**Hard Disk Mania Dept.:** Later this year, look for a leading drive maker to introduce a 3.5-inch 534MB (formatted) **dual-actuator 6-millisecond hard disk!** Besides having fast access time, the platter will spin at 4,800 to 5,400 rpm, thus increasing the throughput, too. A single-actuator model will be available by year's end for less than $1,000!

People keep predicting the end of the disk drive business in favor of silicon, but the drive makers got there first and are fighting an amazing battle.

**OS/2 Watch:** First of all, I got caught in a rare (blush) error by a reader. He writes: *"Two comments. First, OS/2 isn't using a translation layer to run Windows under it anymore. That was the old, Microsoft/Micrografx way. Instead, IBM is running Windows (real Windows, minus a DOS box).*

*"Second, as for your rumor regarding the license, here's the real story (but don't tell IBM you got this from me): According to the Joint Development Agreement (the part rewritten in 1989, that is), Microsoft reserved the right to* ***dictate*** *how IBM puts Windows compatibility into OS/2. They're in the middle of a huge legal battle now. You see, Microsoft wants extra money (in addition to the Windows licensing IBM is already paying for) because IBM is actually running instead of merely translating Windows."*

This comes from one of the few people I know who has had a glimpse of the **secret IBM-Microsoft Joint Development Agreement,** or JDA. Apparently one aspect of the JDA is that if it ever gets out into the public domain (say, someone takes one and anonymously passes out copies), the agreement becomes null and void. I'm told that there are a lot of **skeletons** in it that neither company would like the public (or its other clients) to know about. You have to wonder how there can be a genuine Microsoft-IBM feud while this document exists.

> According to reports, Intel's 586 will be the end of the line for the 80*x*86 family of CPUs, contradicting previous plans for a 786.

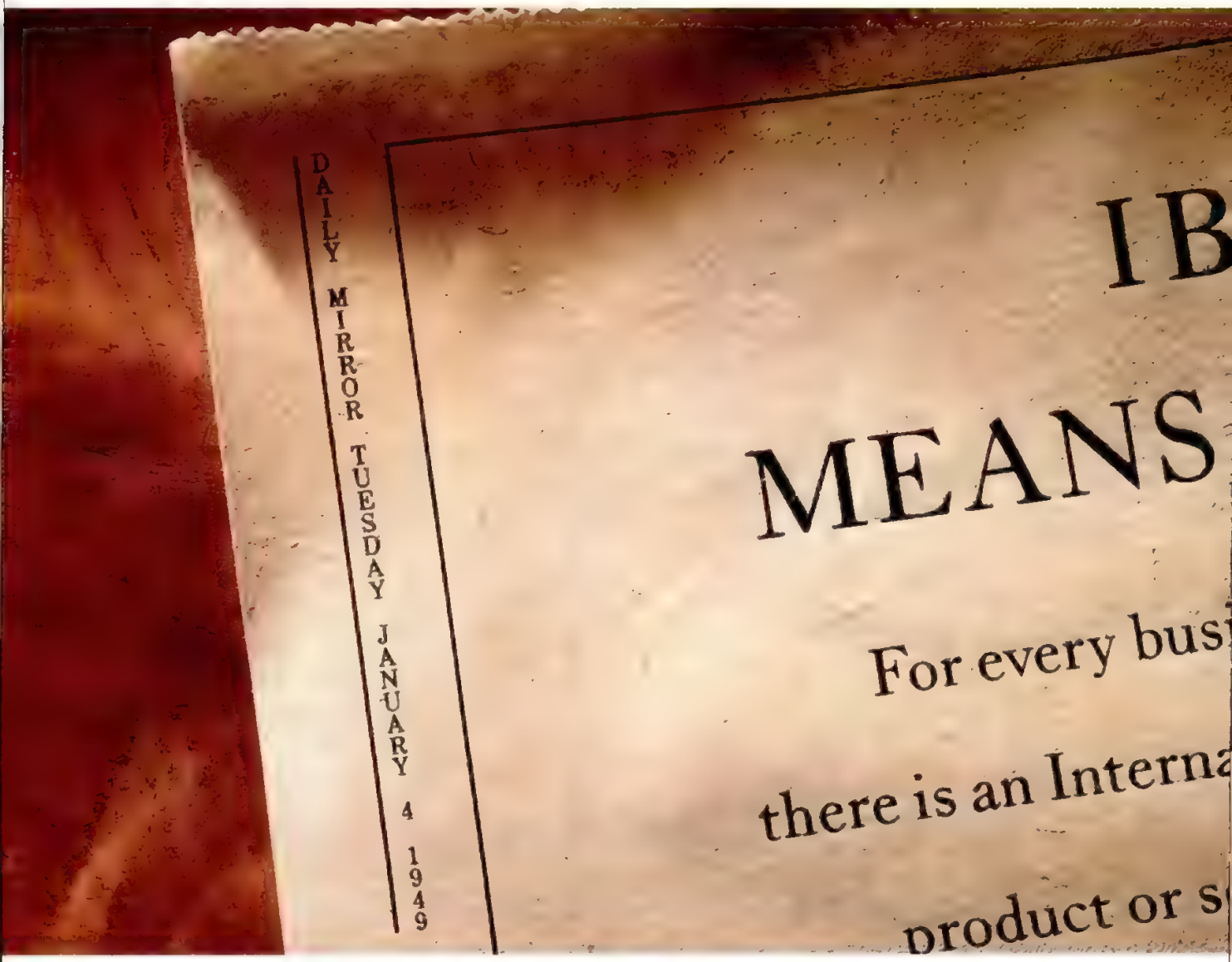
Meanwhile, I've been watching how Microsoft is handling the amazing undercurrent of interest regarding OS/2. One thing that must have shaken Microsoft was a **dubious report** in a trade mag a few months back saying that IBM might just "give away" OS/2. Highly unlikely. Another report said **IBM will do deals:** trade-ins, swaps, fire sales. Hard to imagine. IBM has established a **lively OS/2 forum** on CompuServe (go IBMOS2 at the ! prompt). Highly recommended. By midsummer we'll know if OS/2 will be the big success predicted by many observers. Wagers are being placed as I write these words.

**Notes on Windows NT Dept.:** We need equal time in an election year. As many of you know, two months or so ago Microsoft **replaced its president with a troika.** One member of the group is Steve Ballmer, one-time OS/2 maven. In a live telephone conference given to certain members of the media, he said that the **pricing** for Windows NT will be in the **$400 to $600 range.** This sounds a lot like Ballmer back in the days of his OS/2 promotion, when he was setting high prices for OS/2. The high initial **price of OS/2 helped make OS/2 a flop.** The same thing will happen to Windows NT. It's as though Gillette wanted to make money on the razor instead of the blades. It makes no sense.

**More Bad News:** A mole back from Redmond tells me he got a **secret briefing** on NT. Apparently you will need (as a minimum configuration) a 486 machine, 16MB RAM, and a 300MB hard disk to run the full-featured system.

When this source was asked why so much storage is needed, the answer was "bloated C code." Gads. Why don't we all switch to *Geoworks* just to teach them a lesson? ■

# Our motto.

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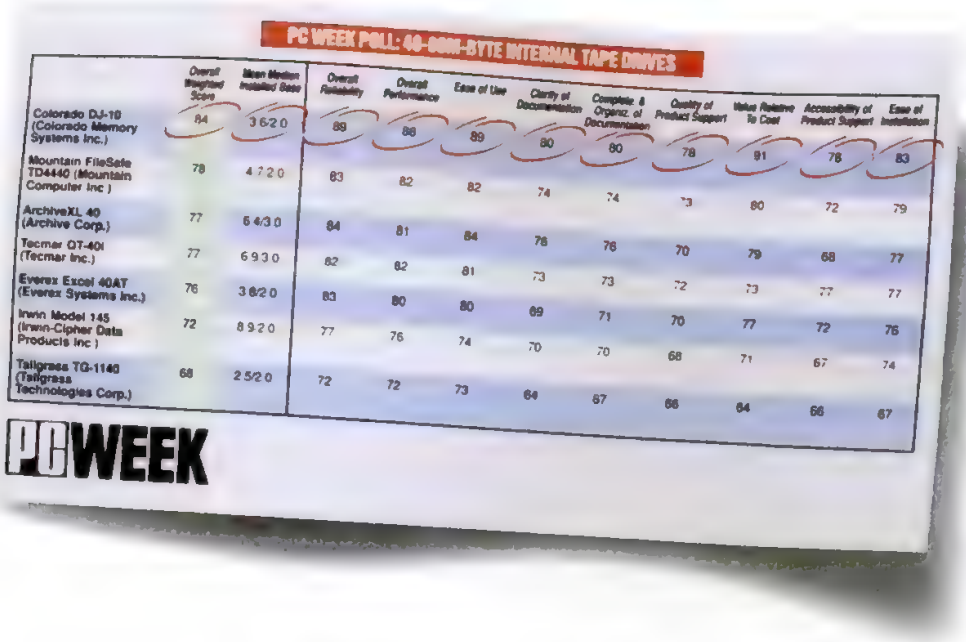

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|---|---|---|---|---|---|---|---|---|---|---|---|
| Colorado DJ-10 (Colorado Memory Systems Inc.) | 84 | 3 6/2 0 | 89 | 86 | 89 | 80 | 80 | 78 | 91 | 78 | 83 |
| Mountain FileSafe TD4440 (Mountain Computer Inc.) | 78 | 4 7/2 0 | 83 | 82 | 82 | 74 | 74 | 73 | 80 | 72 | 79 |
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# Jim Seymour

# Intel's Strategy: Chipsophrenia

**By flooding the market with more CPUs than the public can keep straight, Intel hopes to guarantee its place on top of the processor market.**

A classic strategy in both business and war is Divide and Conquer. In its effort to fend off Advanced Micro Devices and other silicon cloners and thus keep the 386/486 CPU market to itself, Intel seems to be employing another lesser-known but equally useful technique: Multiply and Conquer.

Intel CEO Andy Grove says the company will ship more than 30 variations on the 386SL and 486 chips this year. A generous soul might say that's nothing more than a supplier listening closely to its customers and providing the variety those customers demand. A realist knows that there's a lot more afoot here than just stretching the product line.

AMD's early success with its 386s caught Intel by surprise. By combining compatibility with better performance, AMD scored big wins—persuading some Intel customers to add new PC models using the faster AMD CPUs.

Intel has responded on several fronts. Its legal department began early, with suits and countersuits alleging that AMD, Intel's second-source partner in the glory days of the 286, did not have the right to produce 386s, let alone 486s. On the technical side, an Intel SWAT team lived on the road around the time when AMD's 386s were coming to market. Intel's team delivered a simple message to customers: AMD's chip won't work.

When the AMD chips were in customers' hands and proved they really did work, Intel's strategy shifted to the business front, following five concurrent paths. This has proven a tricky strategy to execute, and it's worth studying for a moment to understand what's really going on in the business right now.

One maneuver was to remind big customers that when chips are in tight supply, those customers want, ahem, a friend at Intel. A second campaign assured Intel customers that a huge promotional push would convince end users of the value of "real" Intel 386s and 486s—and gosh, who'd want to be stuck peddling PCs using those fake clone chips when instead they could tell their customers *their* machines had "Intel Inside"?

A third move was a price cut; 386 and 486 prices fell sharply. In one sense, Intel hurt itself more than it hurt would-be competitors with these cuts. (When you have the largest market share, price cuts take more out of your pocket than out of your competitors' pockets.) But it was still a smart move, putting pressure on the wannabes in this market.

The fourth leg was Intel's effort to reposition 386s strictly as entry-level chips, with 486s—and this year's upcoming "P5," the 80586—as the mainstream CPUs. Whatever the difficulty level of cloning the 386, the 486 is much harder, and the legal arguments for AMD's right to produce 486s are much less robust than its claims to the 386. So undercutting the 386's image for serious business computing tightens the noose even further. (Intel, of course, wrote the book on this eat-your-children strategy with the 286 chip.)

Finally, the fifth leg of Intel's strategy is a phenomenon called "chipsophrenia"—the flood of variations on the 386 and 486. Maybe, Intel figured, the market would become so fragmented that AMD and friends would chase a lot of these variations, stretching their design and chip-foundry capacities to the breaking point. And if the competition chased the *wrong* chips . . . well, the market would take care of them.

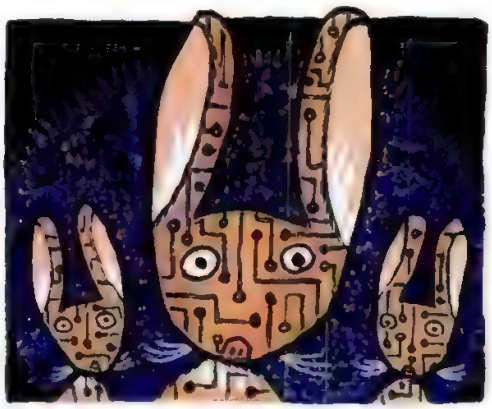

ILLUSTRATION: AD McCAULEY

In most ways, this brilliant strategy has been well-executed and has worked like a charm. AMD's flamboyant leader, Jerry Sanders, admits that Intel's flak screen of proliferating 386 and 486 designs is a serious problem—"throwing a lot of tin foil in the air," he calls it—but he insists that his company will make the right choices. AMD will

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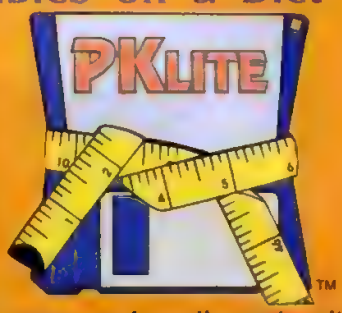


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CIRCLE 089 ON READER SERVICE CARD




compete only with those variations on the 386/486 theme that are destined for market success.

Sanders has piloted AMD through heavy fire before and can probably do so again. The company promises samples of its 486SXs and DXs this summer, with volume production in the fourth quarter.

Intel's defense of its market share may turn into a classic case study at Harvard B-School. It certainly *ought* to: It's full of twists and turns—a business strategist's dream.

Apart from noting, if not necessarily admiring, Intel's efforts, it's important to acknowledge that in one important respect, Intel's CEO Grove is exactly right when he says the 486 is becoming the mainstream CPU, with 386s sliding down the food chain. The 486 got off to a far slower start than anyone, including Intel, expected. As PC Magazine Labs tests have shown, 25-MHz and 33-MHz 386s—not to mention AMD's 40-MHz 386s—have performed very competitively with 486s. Factor in cost, and 386s have continued to make a lot of sense.

And they still do.

But 486 machines available for less than $2,000 will change the equation.

### 486s: THE MOVE TO THE MIDDLE

The 80586 will draw power users to a new generation of PCs, beginning at Fall Comdex—machines not yet ready to deliver, only to tantalize. That in itself will reposition the 486 line as middle-market, with 586s on top and 386s on the bottom.

But the availability of a new chip series begs the question of users' needs. I'm not going to argue that PCs are already plenty fast (everyone who has ever made that argument has wound up looking foolish a year and a half later), but 386s are still good choices for many office-automation and personal applications.

Especially with the first quarter's sharp drops in real street prices—with 386SX machines available for around $1,300, 386DXs not much more, and 486s under $2,000—serious computing power has gotten incredibly cheap.

Perversely, AMD, which provided the competition essential to driving those prices down, may find it has done more to line Intel's pocket than its own. Especially with Grove's "chipsophrenia" strategy. ■

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- MS DOS 5.0
- Systems User's Manual
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- EPS Non-Interlaced 14" Color Monitor 1024x768 SVGA .28
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- MS Windows 3.0 w/Logitech 3-Button, 400DPI Mouse
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PC Magazine: "The EPS 386-33 is a machine that is bursting with promise."

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Computer Monthly: "EPS is as strong an organization as they are smart."

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CIRCLE 284 ON READER SERVICE CARD

◆ *It's always clear and sunny in Advertising Land. Well, just about nearly almost always.*

# If You're Moving To Windows, Beware Of Advertising.

With all the activity in the world of Windows word processing these days, the air is getting thick with confusing claims and conflicting selling points. The good news is, you know what to do in situations like this. Proceed with caution, and remember, it's only advertising.

**IT ALWAYS PAYS TO READ THE FINE PRINT.**

We can understand a software company wanting to present its products in the best possible light. And we have no quarrel with hiring an outside research firm to conduct a head-to-head test of competing word processors.

But honestly. Writing your own ground rules? Confining the test to just eight text-formatting functions (skipping text-entry altogether)? And limiting a national sample to *twenty-four* people? Does that strike you as a far-reaching and unfettered journey after truth? (Even *Family Feud* surveys a hundred people.)

◆ *Will you be standardizing on Windows, will you continue to use a mix of operating systems, or is it still too soon to say? WordPerfect's license will cover you in any event.*

◆ *Which Windows word processor do eight out of ten people — or four out of five dentists — recommend? It all depends on which eight people you ask, and how you phrase the questions.*

You do have to admit it looked good in that big Wall Street Journal ad, though. Did you notice the part — down at the bottom in 3-pt. Myopic Condensed type — where they offer to send you all the disclaimers to their study if you just call 1-800-323-3577? Maybe you *ought* to call. Less for what you'll learn about Windows word processing than about marketing as a blunt instrument.

## DO YOU HAVE DOS FILES YOU NEED TO HANG ON TO?

One of the fuzziest topics in Windows advertising today is file compatibility. Will you be able to get your old WordPerfect® for DOS documents into your new Windows word processor, or not? Yes or no?

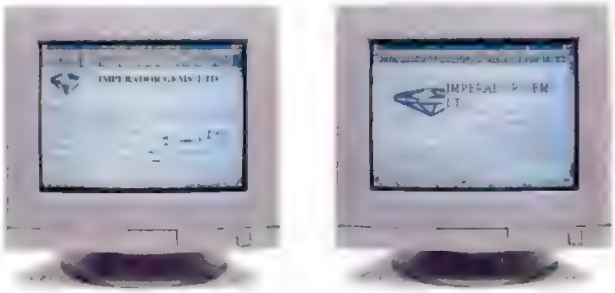
The surest way to find out is to ask for a demo with your own files. What you'll discover is, you can open your WordPerfect for DOS files in WordPerfect for Windows — directly. And you can go from Windows back to DOS the same way. The file formats are identical, so the files are interchangeable.

And as we say in advertising (it's not *all* deceptive, you know), *no other Windows word processor we know of can make that statement.*

## IF YOU RUN WINDOWS UP THE FLAGPOLE, WILL EVERYONE SALUTE?

One year into the Windows phenomenon, lots of people are happy. But there are others who aren't ready to change or simply don't want to.

If your organization has some of each, we have a license that'll make life easier. Right now, you can run WordPerfect for DOS and Windows — under a single WordPerfect license — all on the same computer. With the word processor of choice, the choice is with the user. And that's where we think the choice belongs.



WordPerfect for Windows — That other brand

◆ *When it comes to retrieving documents from WordPerfect for DOS, sometimes the magic works (left) and sometimes it doesn't (right).*

To learn more about any of the WordPerfect programs or licensing, just give us a call at 1-800-526-5225.

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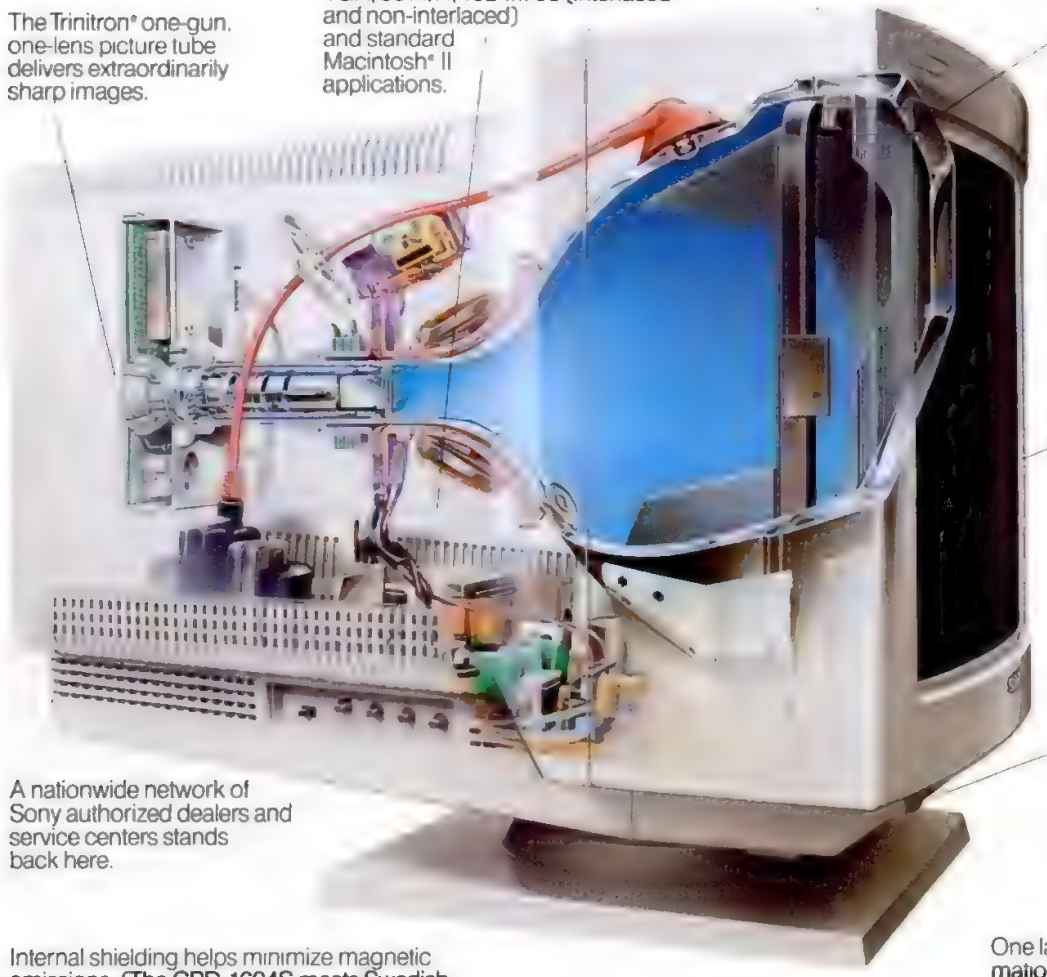
# The inside story on Sony's 17" Multiscan® monitor.

The Sony CPD-1604S Multiscan HG monitor gives you both Sony quality and Sony reliability. And because it's a Multiscan monitor, it supports MCGA, VGA graphics, VGA text, Super VGA, 8514/A, 1024x768 (interlaced and non-interlaced) and standard Macintosh® II applications.

The Trinitron® one-gun, one-lens picture tube delivers extraordinarily sharp images.

The Super Fine Pitch™ Aperture Grille delivers more electrons to the screen for brighter, richer color.



The vertically flat screen gives you a full square-corner image with straighter lines and less distortion. And less eyestrain.

The CPD-1604S puts contrast and brightness controls right where they should be. And everyone knows good ergonomics translates into increased productivity.

A nationwide network of Sony authorized dealers and service centers stands back here.

Internal shielding helps minimize magnetic emissions. (The CPD-1604S meets Swedish standards for VLF/ELF magnetic emissions.)

One last detail: for more information about the CPD-1604S 17" Multiscan HG monitor or any Sony computer peripheral, call 1-800-352-7669.

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CIRCLE 346 ON READER SERVICE CARD

# William F. Zachmann

# Relief from The Floppy Disk Shuffle

**Give me your poor, tired floppy-disk-shuffling wrists yearning to be free and I'll give you a CD full of software.**

Can constantly shuffling floppy disks cause carpal tunnel syndrome? I hope not, because installing today's hefty software packages requires a stack of floppy disks taller than Paul Bunyan's pile of flapjacks.

Consider word processors. Lotus's *Ami Pro* comes on five high-density 3.5-inch 1.44MB disks. *Microsoft Word for Windows* 2.0 requires six. Xyquest's *Signature*, eight. Each is just a single application!

Other types of software are also growing bulkier. A recent version of *CorelDRAW* came on seven high-density disks. Borland's C++ and Application Frameworks 3.0 requires ten high-density disks.

Compared with operating systems, software applications are lightweights. A beta version of OS/2 2.0 came on 24 high-density 3.5-inch disks: an installation disk, 14 disks for the operating system, 5 printer and driver disks, 3 symbol file disks, and a debug disk. Unix has comparable requirements, as will Microsoft Windows NT.

And while I joked about the possibility of getting carpal tunnel syndrome, the time and effort spent on installation is no joke—and is even less funny if you are responsible for a number of systems.

Larger applications beg for better installation methods. The two most promising alternatives at present are LAN-based installation and CD-ROM. Each offers a better way; each has limitations. These limitations will be reduced considerably in the years ahead.

Software distribution over a LAN is the most attractive alternative for organizations where personal computers are networked. It can be done either via shared access to software on a common server or by distributed installation over a LAN. But not all software and not all users are networked, so for many, LAN distribution is not a realistic option.

A brighter prospect is CD-ROM. Although primarily touted as a "multimedia" peripheral, the 600MB or so of data storage on a CD-ROM really isn't enough to live up to the promise of multimedia. The data-storage requirements of full-motion video and other complex multimedia data types exceed the CD's capacity.

As a software distribution and installation medium, however, CD-ROM has a lot to offer. It may prove practical as a way to distribute and install software—applications, data, and even operating systems. Its primary limitations are that there aren't many systems with CD-ROM drives on them, and there isn't yet much software available on CD-ROM. We have, in short, a classic chicken-and-egg problem.

Prospects for a major breakthrough appear bright. Corel Systems Corp. is an early entrant. *CorelDRAW* has been available on CD-ROM for nearly a year now, and the company recently introduced a bundled package with *CorelDRAW*, clip art, and a NEC CD-ROM drive and interface. Adobe Systems is about to ship its font libraries on CD-ROM; you will be able to view the libraries and then purchase the code to unlock the volumes on a per-need basis.

Microsoft was an even earlier adopter of CD-ROM software distribution. In addition to *Microsoft Office* and Programmers Library, Microsoft will make CD-ROM a primary distribution mechanism for Windows NT. IBM is also looking toward CD-ROM as a distribution mechanism for OS/2 2.0.

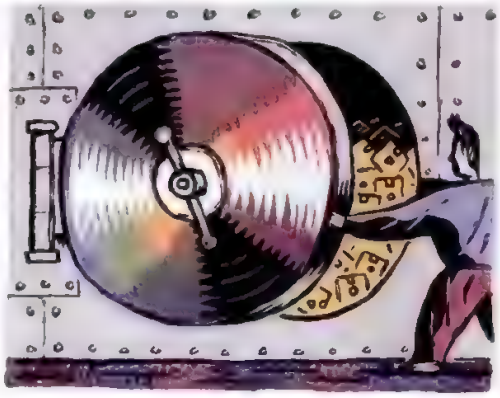
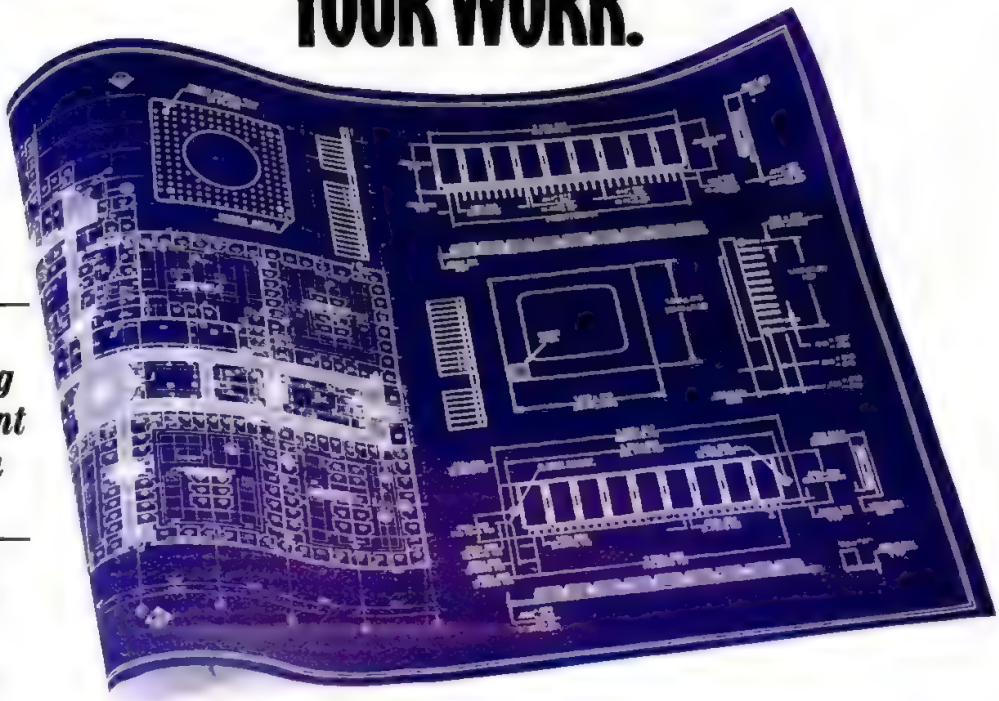


ILLUSTRATION: AD McCAULEY

Of course, the industry has never had a problem filling available storage space. CDs will ultimately be overflowing with data, and there will come a day when you get a sore wrist from doing The CD Shuffle. Down the road, CD-ROM jukeboxes may have to save us; for now, CD-ROM spells welcome relief. ■

# WHICH IS THE B

## YOUR WORK.



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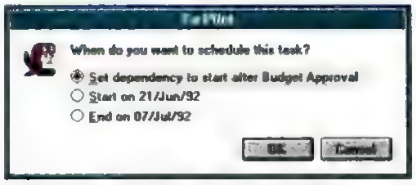


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Clear, concise reporting is critical to getting your projects approved and keeping them on track. Time Line for Windows excels at producing crisp, colorful, and persuasive documents. Features like Autoscale optimize printing—even force documents to one page, making it easy to turn out professional-quality presentations and status reports.

So you see, project management software doesn't have to be such a project. With Time Line for Windows you can quickly take control of your workload. With a lot less work. If your current software isn't working for you, call **1-800-228-4122, ext. 328-P** for more information or a demo disk. Or see your local dealer.

Ask about our competitive upgrade—just $199* (a $699 value).

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CIRCLE 264 ON READER SERVICE CARD

# With features like 32-bit local bus and 142-key keyboard,

Keeping pace with technology – this has always been our goal. As new innovations and new ideas arrive, V-COM is always the first to make them available to the consumer. Now we present to you the V-COM 486 Local Bus System-a ground–breaking product which has us very excited. • What is "local bus"? Well, put simply, it is an inexpensive way to take full advantage of your 486 CPU's 32-bit processing capability. You see, the 486 CPU was designed to communicate with the rest of the computer through a 32-bit bus. The problem is that a 486 ISA bus system can only accommodate 16-bit I/O cards (graphics cards, disk controller cards, LAN devices etc.). In these systems, the CPU still has 32-bit communication with the on-board RAM, but everything slows down when it is force to send or receive information through a 16-bit ISA bus I/O device (such as when it needs to access information on a disk drive or send a video signal to the monitor). Until now, the only way to utilize the 486 CPU's full capability was to spend about an extra $1,000 to buy an EISA bus system. Now with the V-COM 486 Local Bus System, you can get the speed and performance of EISA for about the price of an ISA system. What's more, our local bus system is fully upgradable, accomodating the full range of 486 CPU's, from 486SX-20 to 486DX-50. What does this all mea to you? At last you can enjoy the performance of full 32-bit operation without spending a lot of money. Windows and CAD/ CAM users will be amazed at the increased speed which the local bus provides. Everyone will rejoice when they see how little this system costs. Now you can see why we are so excited about this product. To compliment your high–performance 486 local bus system, we include a 32-bit local bus SVGA graphics

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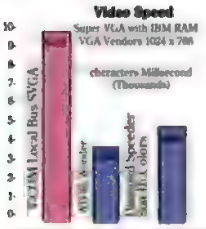


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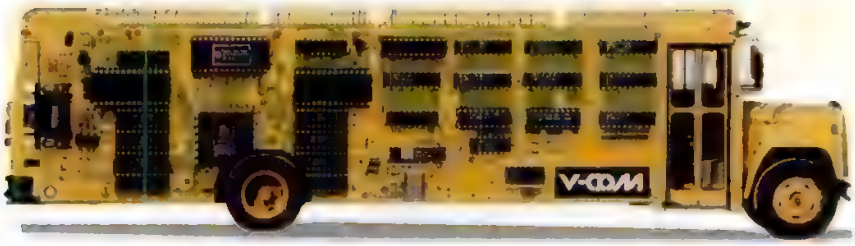


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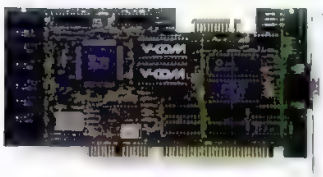

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# Windows

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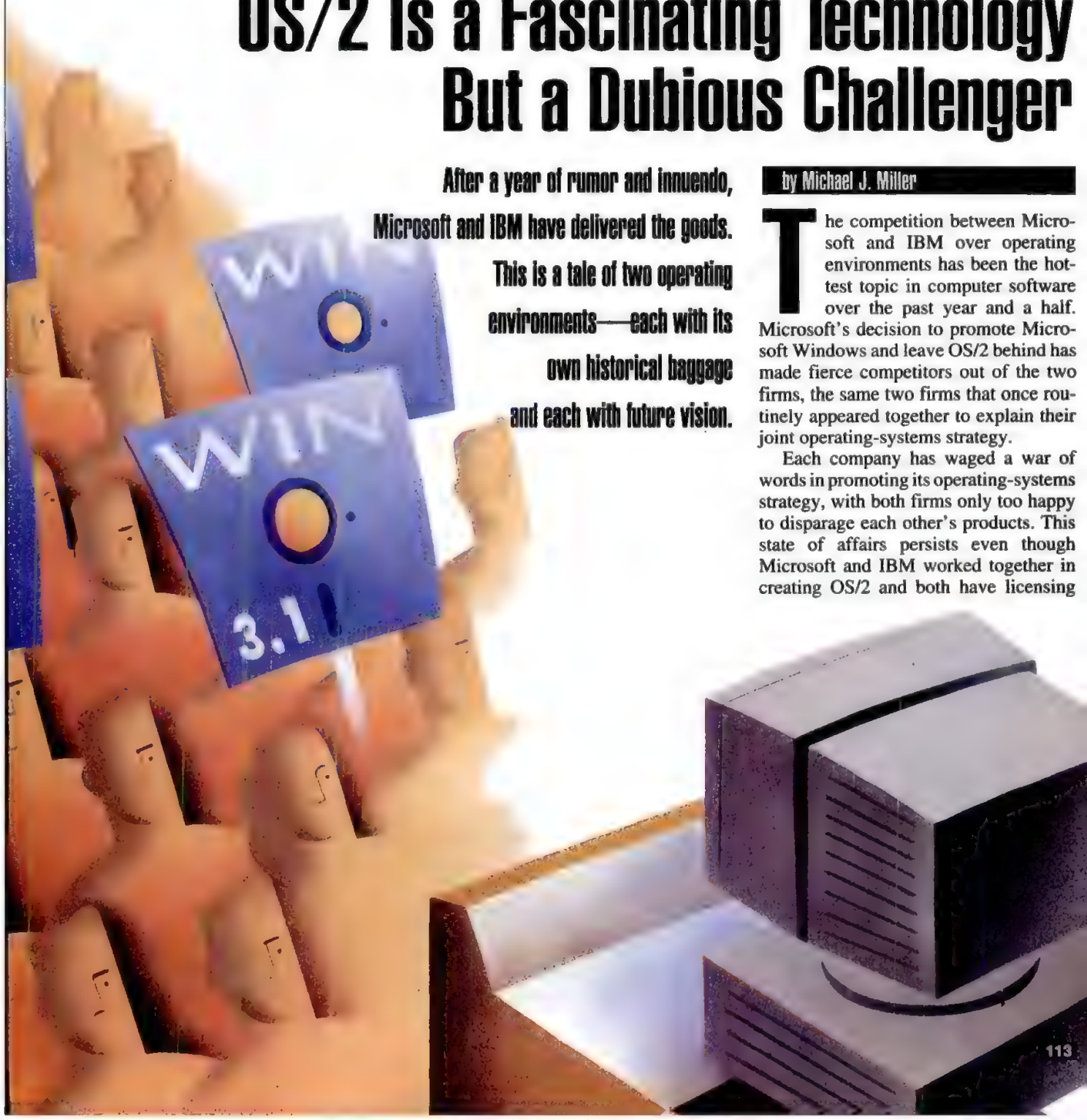
## OS/2 Is a Fascinating Technology But a Dubious Challenger

**After a year of rumor and innuendo, Microsoft and IBM have delivered the goods. This is a tale of two operating environments—each with its own historical baggage and each with future vision.**

by Michael J. Miller

The competition between Microsoft and IBM over operating environments has been the hottest topic in computer software over the past year and a half. Microsoft's decision to promote Microsoft Windows and leave OS/2 behind has made fierce competitors out of the two firms, the same two firms that once routinely appeared together to explain their joint operating-systems strategy.

Each company has waged a war of words in promoting its operating-systems strategy, with both firms only too happy to disparage each other's products. This state of affairs persists even though Microsoft and IBM worked together in creating OS/2 and both have licensing



agreements for each other's products.

For months Microsoft has been saying how good Microsoft Windows, Version 3.1, will be; IBM has been saying how much better OS/2, Version 2.0, will be. But now the products are here, and they will have to stand on their own.

In this special report, we take a close look at both Windows 3.1 and OS/2 2.0. In addition, we have included a collection of over 40 helpful hints, tips, and tricks for working with Windows, including a Windows 3.1 compatibility guide and a special pullout section on every Windows 3.1 file you are likely to encounter, what it does, and whether you need it.

#### THE WINDOWS OF OPPORTUNITY

Microsoft first announced Windows in 1985 (the company had been previewing it for years, originally under the name of Interface Manager). Despite lots of fanfare, that first version of Windows failed to take the market by storm. So did several subsequent versions, although they did lead to the initial Windows versions of applications such as Micrografx's *Charisma*, Corel Systems' *CorelDRAW*, *Microsoft Excel*, and Aldus's *PageMaker*.

Everything changed when Windows 3.0 shipped in May 1990. Windows 3.0 offered a better graphical user interface (GUI), support for extended memory, and a host of user interface changes and speed improvements that made the environment much more popular.

The improvements in Windows 3.0 also led to a flurry of Windows development, resulting in thousands of applications that covered all of the mainstream categories. In fact, almost all significant software developers are now concentrating on Windows applications. Microsoft reports that over nine million copies of Windows have been sold since the introduction of Windows 3.0.

Windows 3.1, scheduled for release in early April, is the first significant upgrade since Windows 3.0 was introduced. Although Version 3.1 contains a number of new features and improvements, it is nowhere near as significant a change as 3.0 was.

Any serious Windows user will want to consider upgrading immediately to Windows 3.1, however. The environment is simply more stable. The dreaded Unrecoverable Application Error message is gone, replaced by more descriptive messages. More important, these messages should appear much less frequently in 3.1. Microsoft has devoted a major effort to improving memory protection and preventing applications from writing to areas of memory that they do not own. For example, Windows 3.1 has patches to trap certain applications that break the Windows rules and then to make sure these applications work anyway.

Although Windows 3.1 maintains the same basic interface as Windows 3.0, it extends the interface in several ways. The biggest addition is TrueType, an outline font manager that gives you scalable fonts that you can use with all Windows applications. TrueType is a big step forward for those people who have been using bitmapped fonts or the fonts that came with Windows 3.0.

> *Windows 3.1 provides screen savers, better drivers and network support, and generally faster operation.*

TrueType fonts take up relatively little disk space and can be scaled to any size. Thus, TrueType does the same basic job that standalone products such as Adobe Systems' *Adobe Type Manager* and Bitstream's *FaceLift* have been doing, but TrueType uses a new type format. Existing fonts can be used along with TrueType or they can be converted to TrueType format with a third-party conversion software product. But if you use conversion software, be prepared for some loss of quality.

Windows 3.1 also features built-in support for object linking and embedding (OLE), which lets you embed or link data from one application to another. This feature lets you create compound documents where you can, for example, click on a chart in a word processing document and automatically return to your charting application so you can easily update and edit it. Some applications already on the market with this feature are *Microsoft Excel* 3.0, *Microsoft Word for Windows* 2.0, and Lotus's *Ami Pro* 2.0.

OLE has already been implemented in several Windows 3.0 applications. But OLE is standard with 3.1 and is a part of the Windows 3.1 accessories including Write and Paintbrush.

Support for sound also comes in the new basic Windows package. In the past, audio support was only available through the Multimedia Extensions for Microsoft Windows, bundled with multimedia PCs and upgrade kits.

Windows 3.1 features a completely revamped SMARTDrive disk cache that includes write-back caching. The File Manager has been completely rewritten. And Windows 3.1 provides screen savers, better drivers and network support, and generally faster operation.

In the process of testing Windows 3.1, Microsoft set up a prerelease beta program that included over 15,000 sites. Versions of Windows 3.1 have been stable if not perfect for months, and many of us at *PC Magazine* have already made it our primary operating environment. It offers enough advantages, particularly in stability, that almost every Windows 3.0 user is going to want to upgrade. Those who were reluctant to move to Windows may find that Windows 3.1 makes it safe to jump into the water.

#### THE OS/2 CHALLENGE

Back in April 1987, while Windows was still languishing, IBM and Microsoft jointly announced a new operating system: OS/2. At the time, OS/2 was touted by both firms as the logical successor to MS-DOS. OS/2 was designed from the ground up as a multitasking, multithreaded operating system that made use of the protected-mode operation of the Intel 80286 and subsequent chips.

When it was first announced, OS/2 had several advantages over DOS and Windows. It allowed for larger applications, it allowed applications to be run simultaneously, and it was a much more protected operating system. One application crashing was less likely to bring down the whole operating system and your other applications along with it.

Even though OS/2 overcame some hefty technical barriers, it met with limited success. Early versions were not very compatible with existing DOS applications, driver support was limited, and the operating system was considered too slow and too big to be run on the popular

# DECISIONS, DECISIONS

by Michael J. Miller

## FIVE REASONS TO BUY WINDOWS

**1. You can create documents rich with fonts, graphics, and more.** Once you have experienced complicated word processing in a graphical environment such as Windows, you will never be satisfied with DOS-based word processing again. The same is true if you want to put fonts and graphics in other applications, such as spreadsheets.

**2. You can run multiple applications.** Windows applications are designed to be run concurrently, so you can easily load word processing, spreadsheet, and graphics programs all at the same time.

**3. You can combine applications.** Dynamic data exchange (DDE) and object linking and embedding (OLE) give you more options for sharing information among applications than anything else currently available.

**4. If you do not like Windows, you can always remove it.** Windows is easy to remove—or to ignore.

**5. All of the major developers are focusing their resources on Windows.** The best reason of all: Every major developer we talk with is concentrating its efforts on first making great Windows programs and then porting to other environments, such as OS/2.

## FIVE REASONS TO BUY OS/2

**1. You have already developed internal OS/2 applications and do not want to move them to Windows.** You bought IBM and Microsoft's hype the first time around, and now you are stuck.

**2. You need to develop a high-end application that requires 32-bit processing and a real multitasking, multithreaded environment.** This is where OS/2 really shines. OS/2 provides these features today, while Microsoft is only promising them for Windows NT.

**3. You need an application that requires multiple communication sessions.** OS/2's multitasking, multithreaded features really make this work. DOS and Windows applications can try, but they just do not have the necessary protection.

**4. You are an IBM-only shop.** In this case, you don't need any other reason.

**5. You are ready to meet the future today.** Someday soon, we will all have 32-bit true multitasking operating systems, but OS/2 is here now. Just remember that the pioneers are the ones with the arrows in their backs.

## FIVE REASONS NOT TO BUY WINDOWS

**1. You have to relearn your applications.** No matter how compatible the Windows version of your favorite application is, you will have to learn different ways of working under Windows to take advantage of new features and the new environment.

**2. Windows is slower than DOS.** The fastest DOS applications are always quicker than the fastest Windows applications at tasks such as data and text entry. DOS does not produce fancy fonts or menus, but it does give you speed.

**3. There are still more DOS applications than Windows applications.** And this will be true for the foreseeable future, particularly in vertical markets. Of course, you can run DOS applications within Windows, but if you don't need Windows applications, why bother?

**4. You do not have the hardware.** Don't even think about Windows unless you have a 386SX or better with at least 4MB of memory and at least a 60MB hard disk. The same goes double for OS/2. If you are a 286 user and you still want a graphical environment, there's always *Geoworks Ensemble.*

**5. If you want multitasking, *DESQview* does a better job with DOS applications.** *DESQview* is faster and simpler and has far fewer system requirements than Windows. You can even run Windows in Standard mode within a *DESQview* window (though this is not recommended for the faint of heart).

## FIVE REASONS NOT TO BUY OS/2

**1. There are few applications.** Sure, you can run DOS applications under OS/2. You can do this on a Macintosh, too, with proper software. You can also run Windows applications under OS/2, though not as smoothly as you can under Windows. But the reason to choose an operating system is access to unique applications. Many software companies are porting one or two applications to OS/2, but they are all still concentrating on Windows.

**2. Unix already offers a 32-bit multitasking operating system.** Unix has been available for a lot longer than OS/2, and you may already be using it. Also, Unix supports a graphical environment, at least in the form of The Santa Cruz Operation's Open Desktop. But do not even think about running Windows applications.

**3. You can run only some Windows applications.** Yes, you can run most Windows applications within OS/2. But the process is far from simple, and applications still do not work as well under OS/2 as under Windows.

**4. The installation process is ridiculous.** A full installation of OS/2 takes up 30MB and nearly an hour of your time (if you get it right the first time)—and this is without installing any real applications.

**5. You inherit the problems of three operating systems.** You will spend a lot of time in OS/2 trying desperately to remember which application is running in which environment, and you will experience the problems of all three environments.

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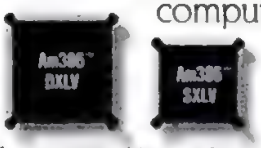


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and affordable machines of the day.

As a result, sales were slow, and relatively few mainstream OS/2 applications ever appeared. But OS/2 was received favorably by many corporate developers, particularly for server-based applications (such as client/server databases) and applications that required multiple communications sessions.

Although subsequent releases of OS/2 fixed many of its more obvious problems, sales remained relatively modest. When OS/2 first came out, Microsoft and IBM positioned Windows as a transitional operating environment; Windows users would one day move to OS/2. But after OS/2's sales proved disappointing and Windows 3.0's sales took off, Microsoft started focusing on Windows and its successors. Meanwhile, IBM remained committed to OS/2, and took over the primary development responsibility for OS/2 2.0. At press time, OS/2 2.0 was scheduled to be released by the end of March 1992.

*IBM has indeed made good on its promise to provide seamless Windows.*

OS/2 2.0 is a substantial step forward from previous versions. It includes a 32-bit programming interface, so developers can write 32-bit applications, which theoretically can be faster than the 16-bit applications normally created for Windows or OS/2 1.*x*. In addition, OS/2 2.0 is scheduled to include a 32-bit graphics engine that should provide a substantial speed advantage for applications. (The graphics engine will probably not ship as part of the initial release.) And OS/2 2.0 continues to be a true multitasking, multithreaded operating system, with all of OS/2's traditional advantages for client/server applications and applications that require multiple communications sessions.

Perhaps the biggest change is compatibility, however. IBM appears to have learned a lesson from the complaints about compatibility that dogged OS/2 1.*x*. Not only is the DOS emulation within OS/2 greatly improved, but you can now boot DOS itself in a DOS window. IBM is positioning OS/2 as "the integrating environment," able to run DOS, Windows, and OS/2 applications simultaneously.

IBM officials have even described OS/2 2.0 as "a better DOS than DOS and a better Windows than Windows." This description should be taken with a grain of salt. From a technical standpoint, OS/2 2.0 does appear to be a "better DOS than DOS." Of course, the same can be said of *DESQview*, which is much simpler to install, or Windows. OS/2 2.0 lets you run multiple DOS programs at the same time; each application can have more memory available than under DOS. You can also selectively load and assign drivers to individual DOS sessions if needed, but this can be a bit complicated. The latest version of OS/2 we were able to test implemented the seamless Windows feature. This lets you run multiple Windows applications, each in its own window, on the OS/2 Workplace Shell Desktop. In our tests this worked surprisingly well; most applications worked with reasonable but not stellar performance. There's even a utility you can use to implement DDE, but not OLE, between Windows and OS/2 applications.

On the other hand, installing Windows applications on your OS/2 desktop is not as straightforward as it is on a Windows platform. And you are limited to running Windows applications in VGA resolution (640-by-480 with 16 colors); higher resolutions are not supported. We also uncovered a few specific compatibility problems that must be fixed.

Still, Windows support within OS/2 has come a long way very quickly. OS/2 users will now find it acceptable to run Windows applications, even though this alone is not a compelling reason for Windows users to switch to OS/2.

The improved Windows and DOS support will be important, however, if OS/2 is to find a place among desktop computer users. While many major developers have committed to port their applications to OS/2, there are currently far fewer general productivity tools available in OS/2 versions than in DOS or Windows versions.

IBM is also taking a major departure in user interface with OS/2 2.0. Instead of the Presentation Manager user interface used in previous versions, OS/2 2.0 sports an entirely new interface called the Workplace Shell. (The old shell is available as an option.) The Workplace Shell is an object-oriented interface that works more like the Macintosh than either the Presentation Manager or Windows. The Workplace Shell no longer has a menu bar across the top but instead uses the right mouse button to bring up pop-up menus with choices for each object (such as a file or a folder).

There are some advantages to the Workplace Shell. You can create copies of objects in the Workplace Shell, so you could keep objects pointing to a document in both a word processing folder and a project folder but still have only one version on your machine.

The Workplace Shell represents a big departure from the way that most people use the operating environment, particularly in the object orientation and use of the right mouse button. Early versions appeared to have a steep learning curve, especially for people used to other graphical environments, but IBM said this would be corrected in the shipping version.

Currently, OS/2 appears to be best suited for those people developing in-house applications that rely on its special features, and for people who use OS/2-specific applications along with some DOS or Windows applications. General users probably will not find OS/2 a compelling environment because of the complexity and size of the environment (a full installation takes about 30MB), the relative difficulty of installing and maintaining it, and the lack of many applications native to OS/2.

#### OTHER CHOICES

While Windows 3.1 and OS/2 2.0 are grabbing most of the headlines today, there are other operating systems in the wings. Microsoft is readying Windows NT, a 32-bit operating system that should be able to run existing Windows applications without much modification. Windows NT should also let developers add 32-bit features to their existing Windows applications and provide better and more sophisticated security features. The Santa Cruz Operation already offers Open Desktop, a 32-bit graphical, multitasking operating system based on Unix. Other Unix-based GUI operating systems are now being ported to the Intel-compatible architecture from other machines, including SunSoft's Solaris and NeXT's NeXT-

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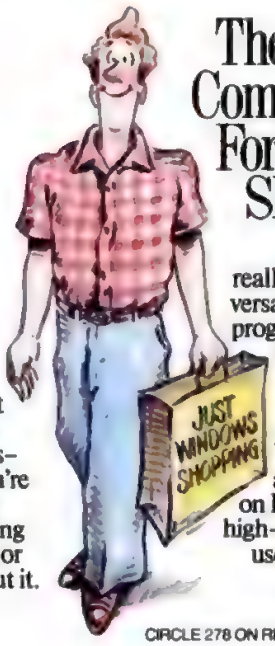
- ★★ Relay Gold
- ★★ MicroPhone II for Windows

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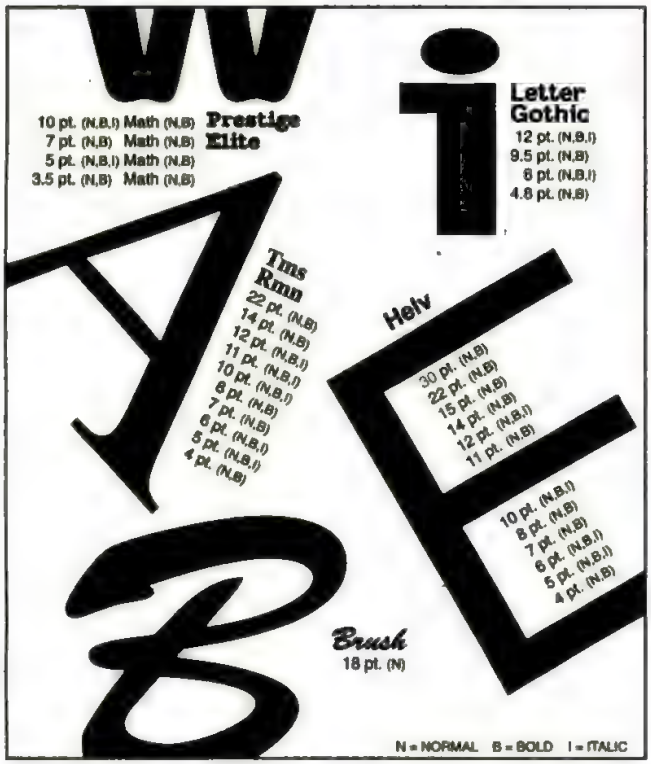

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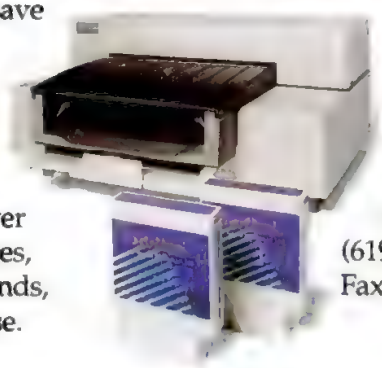

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* 25 in One! for DeskJet is compatible with the DeskJet 500C only when used with a black ink cartridge.

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step. And an Apple and IBM venture called Taligent is developing new object-oriented operating-system technology.

You can expect to see many of the same features no matter which operating system ultimately prevails. The operating system will be a 32-bit environment designed to run on 32-bit machines based on Intel 80386 and 80486 architectures. The system will be graphical, with icons and either pull-down or pop-up menus and multimedia support. It will let you run multiple applications simultaneously, and it will offer better support for networks, connectivity to larger systems, and multiple communications sessions. And it will most likely feature some object-oriented features, such as being able to control the properties of individual parts of the system and embed applications within other applications.

In the short term this may be confusing, but the result is likely to be more sophisticated, more robust applications. If developers can keep their user interfaces evolving as the operating systems get more powerful, applications may even get easier to use. But one thing is certain: You will need more and more hardware to get the most out of your applications.

### A FAREWELL TO DOS?

Does this mean the end of DOS? Of course not. Many people who currently run DOS-based applications or have less powerful hardware are quite content with their current operating system. DOS applications also tend to be leaner and faster than current GUI applications.

Both Microsoft and Digital Research are planning future versions of their DOS products. Most major software developers, except Microsoft, plan continued upgrades of their DOS applications.

So while GUIs do not mean the end of DOS, they do mean that new applications—those that provide graphics or require multitasking—are likely to be developed for the new environments. For many people, this will mean a big investment, both in more sophisticated hardware and in learning new ways of using their computers. Judging from the initial acceptance of Windows and Windows applications, many users will think that this investment is well worth the cost. ■

*Michael J. Miller is editor-in-chief of* PC Magazine.


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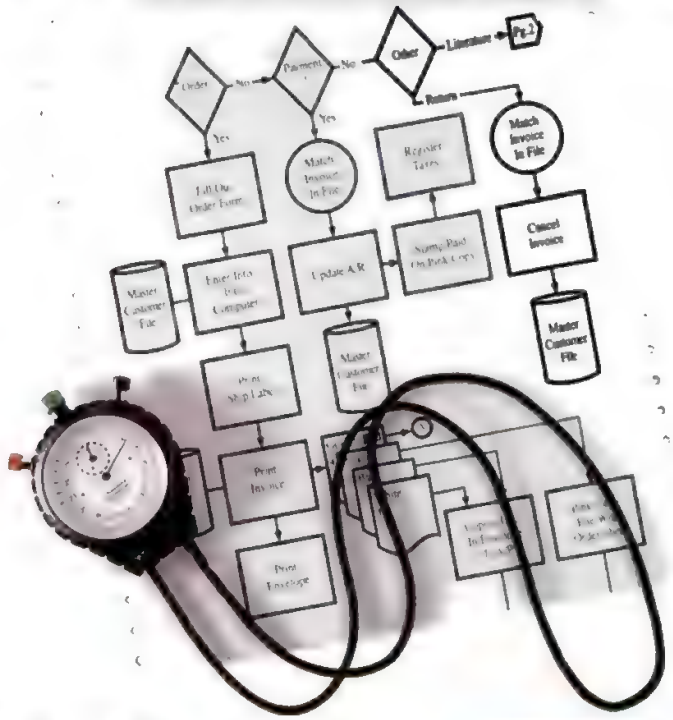

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# Windows 3.1 Brings More of Everything

**An end to UAEs, a new print engine, a smarter SMARTDrive, and more: Microsoft adds the polish to make Windows a stable and rich environment.**

ILLUSTRATION: COCO MASUDA

by Gus Venditto

Microsoft Windows, Version 3.1, is not the minor upgrade that its modest name change suggests: It's a thorough overhaul with bug fixes, performance enhancements, and significant new features. If you've been sitting on the fence waiting for Microsoft Corp. to fix the problems with Windows, Version 3.1 is your chance to act. Most of the rough edges are now smooth.

Windows 3.0 was plagued by instability in the form of Unrecoverable Application Errors (UAEs), which caused system crashes. The UAE problems are largely solved in Version 3.1. Microsoft has distributed three major releases of the preview version since June 1991 to thousands of testers; the last one, which this review is based on, shipped in January.

This version had some of the minor glitches common to all late beta-version software, but many of the situations that

used to cause UAEs were no longer a problem. Microsoft says the solution is better parameter checking, which prevents the memory overwrites that caused UAEs to occur in the first place.

The performance enhancements are the result of a vastly improved disk cache, a new printing system, and an overhaul of the internal code. You won't be overwhelmed by the performance improvements unless you've got plenty of RAM to spare. On systems with less than 4MB, Windows 3.1 will seem only slightly faster. But if you do have plenty of RAM, you'll find features such as SMARTDrive's new write-back cache to be a welcome change.

It also helps to be running a 386 or better. Windows 3.1 will show more improvement on a 386 than on a 286 or 386SX, since some of the enhancements take advantage of 32-bit data transfers.

But if you've resisted Windows because you dislike graphics environments, or you don't want to invest in the hardware, there's little in Version 3.1 that will change your mind. In fact, Microsoft has made the platform even more graphical and has written off the constraints of 8086 Real mode. Windows 3.1 requires more RAM than before and has only two modes: Standard and 386 Enhanced modes. It will run in Standard mode on systems with just one megabyte, but not well.

The improved stability and speed are the most important part of the story, but there are many exciting subplots. Other new features range from major additions such as object linking and embedding (OLE), the integrated WYSIWYG printing system, TrueType fonts, and new sound functions to small enhancements such as a Startup group that works like a Windows version of AUTOEXEC.BAT and a Character Map utility that solves the problem of having to use special ANSI characters.

### UAEs: LESS FREQUENT AND RENAMED

Microsoft's official position on the haunting UAEs that afflicted Windows 3.0 is that non-Microsoft programmers were to blame. UAEs usually occurred when one program wrote to a memory address already claimed by an earlier program or attempted to invoke a function with program code that Windows could not understand. Microsoft claimed that if programmers played by the rules and thoroughly debugged their own programs, these problems wouldn't occur.

*In Windows 3.1, Microsoft has taken aggressive steps to solve the UAE problem.*

Fortunately, Microsoft has taken aggressive steps to solve the UAE problem. There's improved parameter checking in Windows 3.1, which attempts to prevent programs from stepping on each other's memory. And when UAEs do occur, you won't encounter the uninformative messages in Windows 3.0. Microsoft has replaced the generic UAE message with more than half a dozen new messages with useful information about the error.

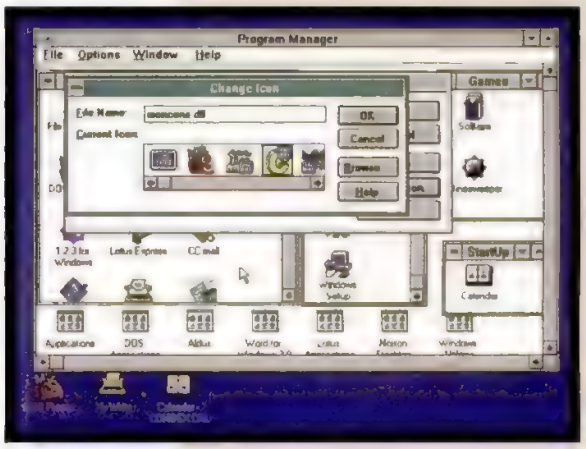
The new error messages are more specific and have informative warnings such as "General Protection Fault." In addition, these messages include the memory address where problems occurred, as well as hints that help to explain the cause of the problem; these will be useful to the programmers of the offending software. The process of thoroughly debugging Windows will probably require active user participation, and it will be important to record these messages if they occur. There's nothing that users can do when they encounter one of these messages, other than to record it and report the message back to Microsoft or the vendor of the problematic software.

### DR. WATSON ON THE CASE

To help keep that recording process going, Microsoft is including Dr. Watson, a diagnostic utility. Dr. Watson is not included in the default installation. To run it, type DRWATSON at the Program Manager's File Run command. Or, if you prefer, you can install Dr. Watson to be run from an icon.

Dr. Watson works like a silent sentinel. You won't see it until a system error occurs. Then, after the Windows system error message appears, a Dr. Watson dialog box will pop up and ask you to describe what you were doing just before the error occurred. Dr. Watson then saves your comments and a record of the machine's state. It won't eliminate bugs or memory conflicts, but this file can then be used to help Microsoft or a third-party software developer diagnose and remedy the problem.

Windows 3.1 is demonstrably more stable that Windows 3.0; actions that would induce UAEs in the older version no longer generate system-halting errors. But system-halting errors did occur during testing with the early version. When the errors occurred, we were usually able to store data and quit the system neatly. However, they did sometimes result in a hung machine and data loss. These errors always occurred when we tested printing using TrueType, data-sharing using OLE, and other new programs that weren't in final testing. Most (if not all) of these errors may be eliminated in the final shipping version.




Several dozen new icons are included with Windows 3.1; many of them are accurate representations of the logos for DOS products. The Startup program group acts like a Windows version of DOS's AUTOEXEC.BAT.

Another protection against program conflicts is a further isolation of programs when running in 386 Enhanced mode. When you run into a problem, simply press Ctrl-Alt-Del; instead of rebooting, Windows 3.1 will let you shut down the active program and keep on going with the rest of your Windows programs. It may not provide absolute protection against disasters, but it's a step in the right direction.

# When you look at windows, it's not always clear what's behind them.

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**FROM PASTING TO OBJECT LINKING**

The richest set of possibilities opened up with this version will be found in an area guaranteed to create confusion: object linking and embedding. The idea behind OLE is to provide a software-independent format for data so it can be accessed by any Windows application, not only the one that created it.

This specification was advanced by Microsoft over a year ago and some Windows programs already support it, including *Ami Pro,* Version 2.0, and *Microsoft Excel,* Version 2.0. Some leading Windows programs, such as *PageMaker, WordPerfect for Windows,* and *Lotus 1-2-3 for Windows,* still don't include it.

Windows 3.1 adds four of its own accessory programs—Write, Paintbrush, Cardfile, and Sound Recorder—to the roster of OLE-compliant programs. And it adds Object Packager, a utility that can turn programs or embedded data into an object with unique properties.

OLE makes it possible for applications and their associated data to be accessible from other applications. By using the Paste or Paste Link commands, Windows automatically converts the data to one of the three formats known to Windows: metafiles, text files, and bitmaps. In the OLE scheme, applications can either be clients or servers. *Server applications* are programs where linked or embedded data is created. *Client applications* are programs that receive OLE data that is linked or embedded. Paintbrush and Sound Recorder are OLE servers; Write and Cardfile are OLE clients.

When data is *linked,* it is stored in a separate file but is accessible to both the server and client applications. You can make changes to the linked data through the server application and the changes will be reflected in the client application. You can also make changes to the linked data by double-clicking on the object within the client application.

When data is *embedded,* it is stored within the client application and can only be accessed through the client application. To edit the data, you must double-click on the object within the client application. If you don't want your document to be composed of lots of separate files, you would choose object embedding rather than linking.

For example, if you embed a .PCX graphics file into a Write document, you edit the graphics image by double-clicking on the embedded data. Paintbrush will then load. When you're finished editing, you close Paintbrush and are back in Write.

**LINKING, EMBEDDING, OR PASTING: YOUR CALL**

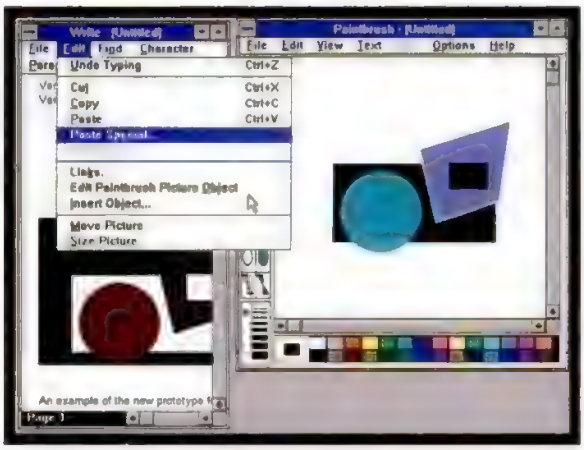
If editing the data in the object isn't important to the task, you can paste it as static data rather than linking or embedding it. In this case, double-clicking on the object will not trigger the server application.

Whether you want to link, embed, or paste data objects, the process of moving data from an application that can act as an OLE server to a program that acts as an OLE client is very similar to a standard cut and paste. The difference is at the paste stage, when you must choose, through menu options, whether to link, embed, or paste the data into the client application. When it works, OLE is a wonderful tool, but this early release is still plagued by rough edges and surprising twists of events. (For a hands-on tour of OLE, see the sidebar "Object Linking and Embedding: A Survival Guide" in the Windows 3.1 tips feature in this issue.)

**THE OBJECT PACKAGER**

In addition to the four OLE-compliant accessory programs, Windows 3.1 also adds a utility that lets you turn just about anything into an object, even programs that don't have OLE features. It's called Object Packager and it appears in the Accessories group. When you make a package out of embedded or linked data, you can treat it as a self-contained object with an icon and label of its own that you can insert into OLE client applications.

In this form, objects are easier to work with; for example, if you've embedded a spreadsheet range in a report, you probably don't need to see it all the time. It could be confusing to people working on the document, since they'll think the numbers in the spreadsheet can be edited the same way they edit the document. By turning the spreadsheet range into an object, with




**The design in the Paintbrush window (at right) has been embedded in this Write document; the object has been highlighted so the colors are reversed. When you highlight embedded data in an OLE client application, the Edit menu displays a command that will let you return to the OLE server application so you can edit the embedded data.**

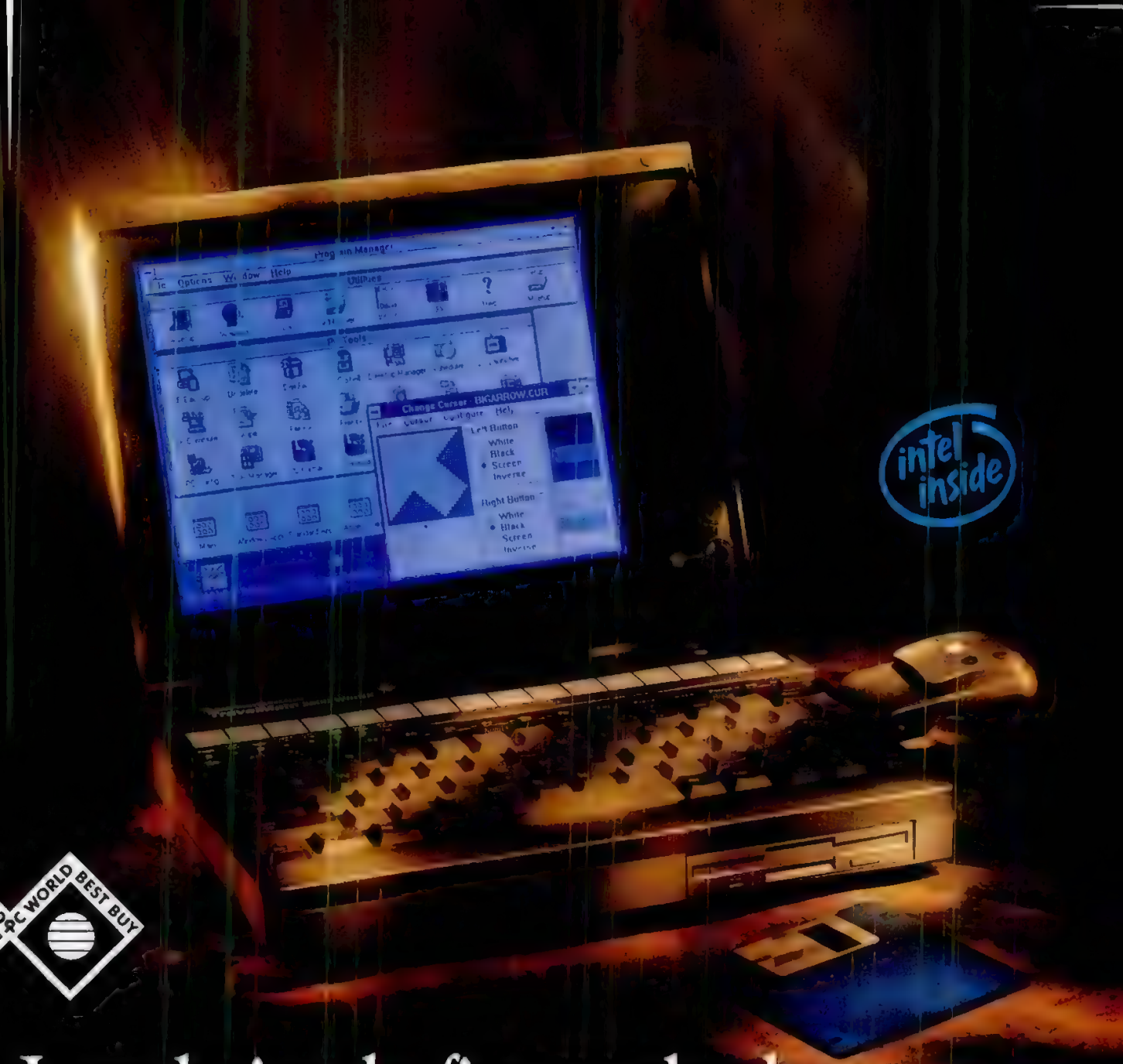
## WINDOWS AT A GLANCE

### *The Five Best Aspects*

1. TrueType fonts are handsome, simplify the print process, and print quickly.
2. Object Packager is a powerful tool for embedding data or programs within OLE clients.
3. SMARTDrive is easier to use and faster than before.
4. A choice of fonts in DOS makes it possible to read small DOS windows.
5. The Sound Recorder lets you embed audio into OLE client data files.

### *The Five Worst Aspects*

1. There is still no File Copy command in Program Manager.
2. File Manager was completely overhauled but is still awkward.
3. There is still no Undelete command anywhere in Microsoft Windows.
4. There is not enough OLE. After proselytizing OLE specs to other vendors, Microsoft Corp. should have made sure that Windows provided more OLE capability.
5. Windows still requires too much RAM.

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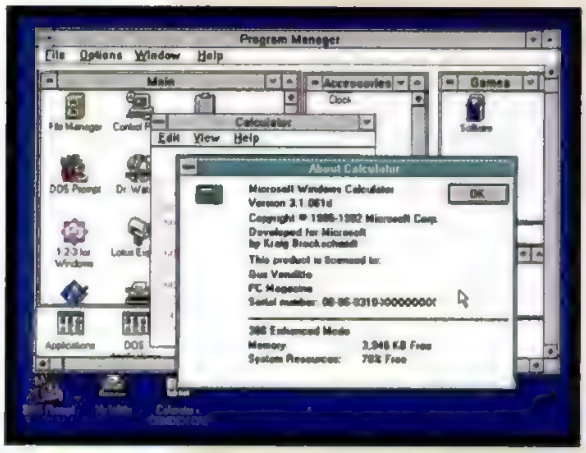
an icon of its own, you can make it more clear that double-clicking this data will cause a separate program to run.

Packaged objects can also include a command line. This lets you easily create a package that runs a DOS batch file from within a Windows program. Or you could insert a Calculator icon into a Write document.

When you use the Object Packager, an application doesn't have to support OLE to act as a server. However, packaged objects can be inserted only into applications that support OLE.




The About box in all of the Microsoft Windows accessories, such as Write, Print Manager, and Paintbrush, shows available memory and available resources. Windows 3.1 doubled the amount of memory available for system resources.

#### MORE RESOURCES

The irritation of running low on system resources (the memory within Windows used to store information about a program's menu structure, dialog boxes, and so on) has been largely remedied. Some of the Windows code, such as in Program Manager, is now more efficient in its use of resources. But overall, Microsoft didn't waste too much programming time trying to finesse this problem; it simply doubled the amount of RAM devoted to the resource pool from 64K to 128K. That should be enough to accommodate anyone running three or four programs, even if the programs are resource hogs.

On our tests, we found that on the same system, Windows 3.0 had 75 percent of the system resources remaining at startup; Windows 3.1 had 85 percent. After loading File Manager, *Ami Pro,* Version 2.0, and *Lotus 1-2-3 for Windows,* Windows 3.0 had only 19 percent of its system resources remaining; under Version 3.1, 57 percent was still free.

Keeping tabs on both system resources and available RAM is easier under Windows 3.1, too. When you choose the About box from the Help menu, all of the Windows accessories display the status of both resources and RAM.

#### PERFORMANCE TUNING

There are minor performance improvements of many tasks in Windows 3.1, though the gains may be not be noticeable on 286 and 386SX systems. The improvements are partly a result of fine-tuning the internal code, partly because of a new 32-bit disk interface called FastDisk, and partly because of an overhaul of SMARTDrive, the disk cache.

We compared the speed results from our graphics-intensive tests of Windows, Versions 3.0 and 3.1, and they showed no change on most base-level functions. There was about a 40 percent improvement in the common operation of opening a dialog box, but most line-drawing and graphics movement operations performed about the same.

When we used the Compaq Super VGA drivers that come with Windows 3.1 and compared them to Windows 3.0 running the standard VGA drivers, however, we saw some graphics operations improve by 100 percent and more. That could mean your system will perform better if you're able to take advantage of some of the new Super VGA drivers included with Windows 3.1.

It's still the responsibility of graphics board manufacturers to provide Microsoft with drivers, so the level of performance you'll get is partially dependent on the quality of the drivers you can use. Fortunately, you can now change video drivers from within Windows using the Setup program, so it's easier to experiment with different drivers.

Many systems will be able to take advantage of this improvement. On our 25-MHz Compaq 386 test system, Windows 3.0 installed the standard VGA drivers. On that same system, Windows 3.1 automatically installed the Advanced Compaq VGA drivers, providing 640-by-480 mode at 256 colors (instead of 16 colors) and faster performance.

There's no guarantee that you'll get this benefit just because you have a Super VGA board, though. When Windows, Version 3.1, was installed on a system with an Orchid Pro Designer with 1MB RAM, the standard VGA drivers were installed and there was no improvement in performance.

The message is clear: If your Super VGA system is not able to take advantage of the video drivers that come with Version 3.1, make sure you ask the board's manufacturer for an upgrade. (See the Windows 3.1 compatibility chart "Gain with No Pain?" in this issue for a complete listing of video drivers that are currently available for Windows 3.1.) If one isn't yet available, experiment with one of the advanced drivers that comes with Windows 3.1 and see if you can get it to work.

#### SMARTER SMARTDRIVE

Windows 3.1 comes with some internal improvements to disk handling. The most dramatic is a completely overhauled version of SMARTDrive (Version 4.0). It adds write-behind caching to the traditional read caching that was provided in SMARTDrive, Version 3.06 (the version that shipped with Windows 3.0).

Read caching stores copies of data recently read from disk in memory, so that the next time you need it, a disk access isn't necessary. Since accessing a disk is so much slower than accessing RAM, this can vastly increase performance speed. Write-behind caching delays file-save operations for a few seconds, so that you can move on to other tasks without first waiting for a disk write. It can make a big improvement in the way your computer feels, since when you perform a file-save operation, you're usually ready to begin a new task. The addition of the write-behind cache lets your machine respond to your next request almost immediately; it performs the job of saving the file while you're probably occupied with something else.

The write-behind delay is not long. Data is, by default, written to disk at the first idle period and is never delayed longer than 5 seconds. There are risks to using write-behind caching: If your system hangs, data can be lost. To protect against this possibility, SMARTDrive will attempt to intercept the system reset com-

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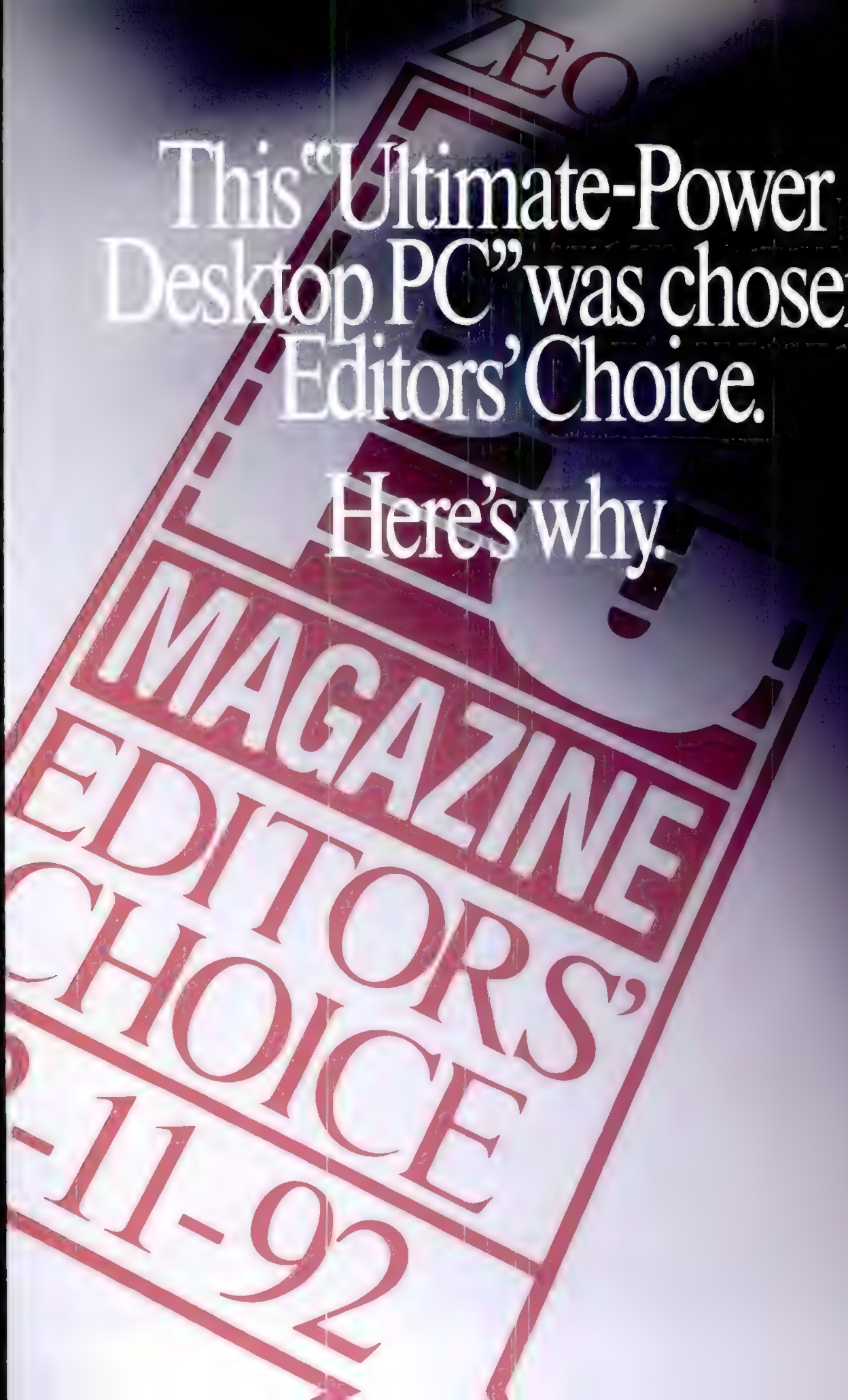

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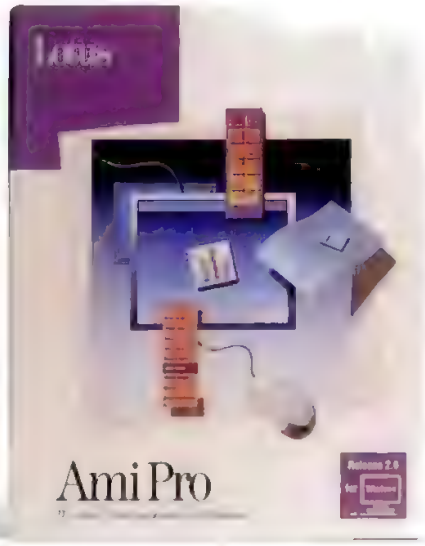
Because right here, right now, ZEOS gives you the option of '486 50MHz power! We're talking power unlike anything you've seen before. Take either the ZEOS 486DX2-50 or the 486DX-50. Absolutely unbelievable *performance!* And the price? That's what you really won't believe; only a couple hundred dollars more than the ZEOS 486-33. *Amazing.*

**AND THAT'S JUST FOR STARTERS.**

Because ZEOS combines the high speed upgradable processor of your choice with some of the fastest DRAM made. Both are mounted on your ZEOS system board, one of the most advanced in the industry. And that's where your new system really begins to shine.

Because to this we add an *incredibly fast* IDE hard drive and genuine Teac® floppy drives. We have located the ports for these drives right on the motherboard along with your serial, parallel and game ports. The result? Two slots are saved, giving your new ZEOS system a total of *eight.* All this while others are trying to get you to accept fewer slots. It's part of your ZEOS expansion advantage. The slots to expand, how about the room?

This is where ZEOS has performed something akin to magic. We call it our SpaceSaver case. Complete with *seven* drive bays (six with the DX-50), this incredible case is actually smaller than many cases offering only five drive bays. Plus, we've also added a *second whisper-quiet cooling fan.* Why? Because the cooler a system runs the longer it will last. Now



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Foldout slip-sheet

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2. Insert this sheet with
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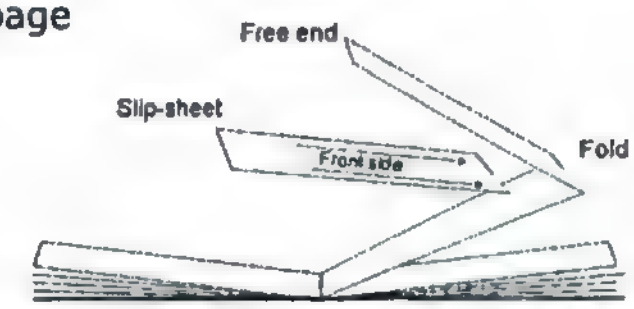
3. Slice the folded edge
4. Close the page and slip-sheet




Inverted Foldout slip-sheet

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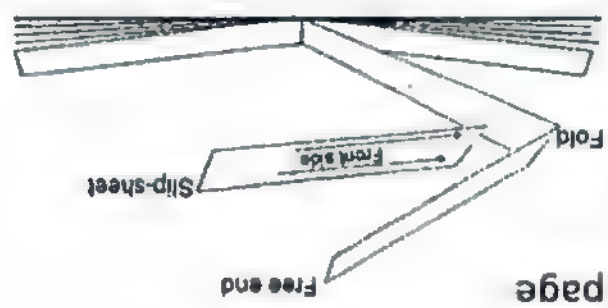

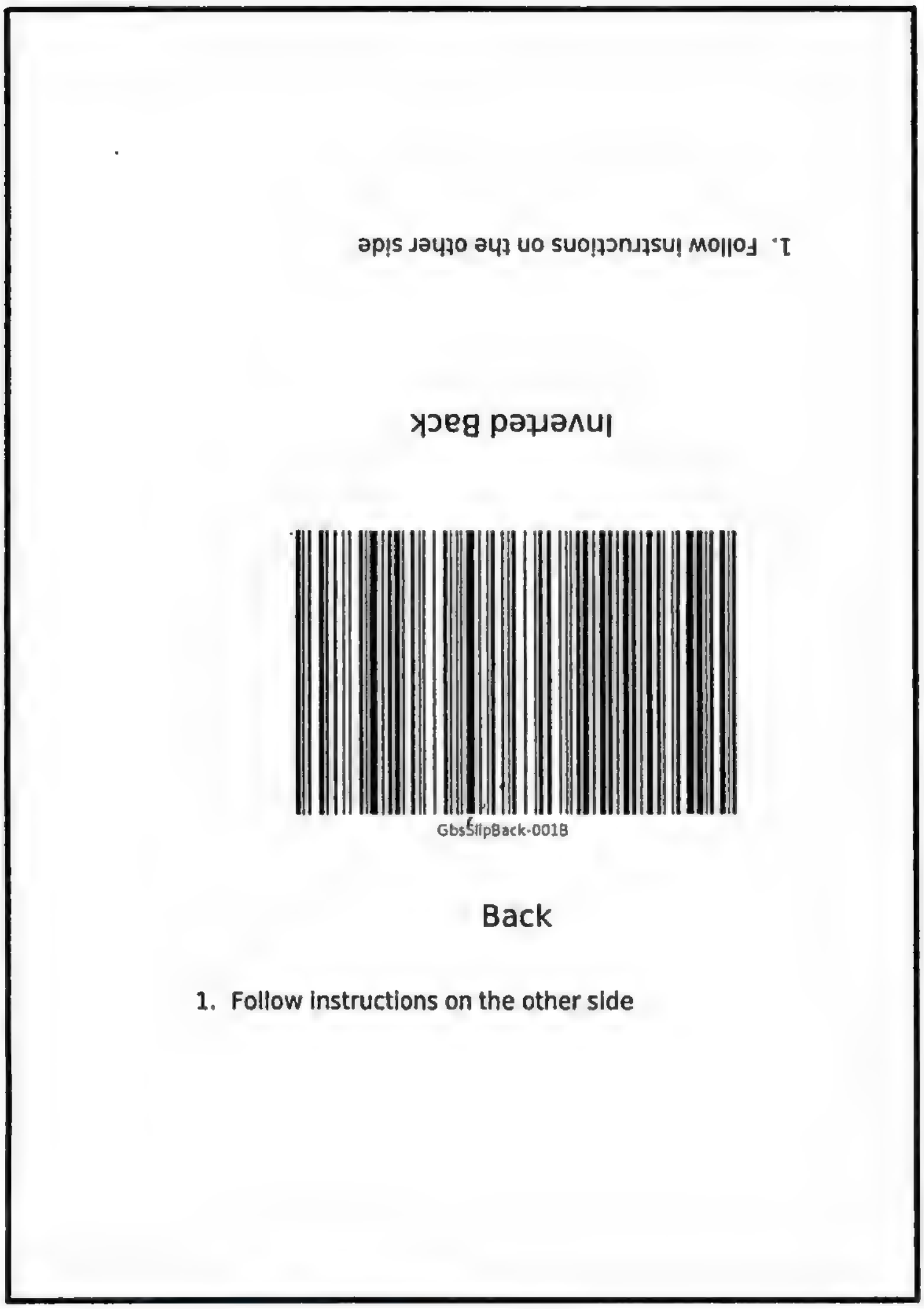
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Back
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Inverted Back
1. Follow instructions on the other side

*PC Magazine* calls it "the ultimate-power desktop PC." What will you call your new *ZEOS '486 Editors' Choice* system? Probably the hottest computer you've ever owned! And that's just for starters.

Because never before has so much value been available for so little money. We call it *ZEOS Value*. Starting with the incomparable ZEOS 386-33 right up thru our two new 486--50s. ZEOS gives you more for your money than anyone else.

*ZEOS. Nine times Editors' Choice. Your Best Choice as Well!*

system comes complete with *Lotus 1-2-3 for Windows* and *Ami Pro 2.0 for Windows*. These are not trial copies or sample discs; they are full blown, fully documented production packages. And, with a suggested retail of over $1,000, even at "street prices" that's a *great* value. It's ZEOS value. After all, ZEOS sets the pace for innovation and value for you in the direct marketing channel. Here's another good example.

# Upgradable.

First of all, our prices are great! You can get a ZEOS 386-33 upgradable for as little as $1,395. Or you can move right into a *complete 486DX2-50MHz for only $1,995*. Outrageous! And it's not just the price. It's all the extras we give you, too.

As an example, your new ZEOS Windows

# ZEOS.

ZEOS is the best computer for your money, no matter how much you spend. Why?

Because ZEOS delivers to you high performance, fully compatible systems with more quality and features than anyone else. Not only that, but our after-the-sale support is second to none. And the prices? They're best described as incredible! It's no wonder *PC Magazine* has awarded ZEOS systems the coveted *Editors' Choice nine times.* Your new ZEOS Editors' Choice '486 is no exception.

After all, the ZEOS '486 upgradables are the hottest systems on the market today. *As PC Magazine says, "it's a lot of computer for a little cash."* And that's an understatement! No matter how much power you're looking for, ZEOS has it for you.

**ANNOUNCING THREE HOT NEW PROCESSOR OPTIONS: '486SX-25, '486DX2-50 AND '486DX-50!**

intel inside

Go ahead and Pick your Power! ZEOS gives you all the options. You can start out by taking a look at the de facto desktop power standard, the 386DX-33. Our '386-33 workhorse is a great entry point for true desktop power computing. But if it's a '486 you're after, hang on to your hat!

Because you're off to a fast start with a 486SX-20 or our brand new 486SX-25. The 486SX is like a 486DX without the built-in math coprocessor. It's the easiest way to own the '486. And for full blown 486*DX* power, why not opt for your

## ZEOS COMPLETE SYSTEM PACKAGE #1

- The processor and speed of your choice plus future upgradability!
- 1MB of high-speed RAM, expandable to a system total of 32MB right on the motherboard.
- 42MB high-speed IDE hard drive with its own cache.
- 1.2MB or 1.44MB Teac® floppy drive.
- ZEOS 14" flat screen Hi-Res amber monitor with Tilt/Swivel Base.
- Shadow RAM and EMS support for enhanced performance.
- ZEOS/RS 101 key SpaceSaver keyboard.
- Two serial, one parallel & one game port built right onto the motherboard.
- 7-16, 1-8 bit expansion slots. 80387 math co-processor support for '386 systems.
- Rugged ZEOS SpaceSaver case with twin cooling fans for added reliability and product life.
- Seven drive bays and our custom 300 watt power supply with built-in surge suppressor!
- Includes ZEOS 24-Hour-a-Day Toll-Free Technical Support and Customer Satisfaction package.

| | |
|---|---|
| 486DX-50 | $2195 |
| 486DX2-50 | $1995 |
| 486DX-33 | $1795 |
| 486SX-25 | $1695 |
| 486SX-20 | $1595 |
| 386-33 | $1395 |

PACKAGE #1

## INCREDIBLE ZEOS PACKAGE #2

We take Package #1 and upgrade your ZEOS Modular System to include:

- 2 full Megabytes of rip-roaring RAM.
- Our incredible 107MB IDE hard drive with its own built-in cache.
- Both the Teac® 1.2MB *and* 1.44MB floppy drives.
- Diamond Stealth Hi-Color VGA card/1MB RAM & Sierra DAC plus WinRIX drawing software!
- ZEOS 14" High Res VGA mono monitor with Tilt & Swivel Base.
- Lotus 1-2-3 for Windows, *plus* Ami Pro 2.0 with Adobe Type Manager, *plus* Microsoft Windows and DOS 5.0, *plus* a genuine Microsoft mouse!

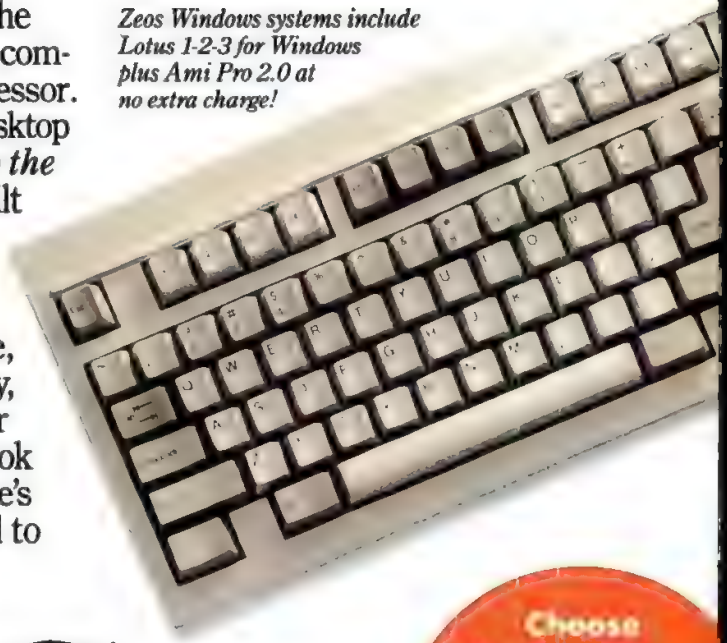
| | |
|---|---|
| 486DX-50 | $2695 |
| 486DX2-50 | $2495 |
| 486DX-33 | $2295 |
| 486SX-25 | $2195 |
| 486SX-20 | $2095 |
| 386-33 | $1895 |

PACKAGE #2

You have probably heard about the importance of protecting your new computer investment with a surge suppressor. Well, your new ZEOS upgradable desktop system already has one. *Built into the power supply!* That's innovation, built in from ZEOS.

Your new ZEOS system really is unlike anything else you can buy. It's better. Whether it's performance, quality, compatibility, upgradability, expandability, reliability, safety or support—whatever it is that you look for in a system, ZEOS has it. Here's another innovation we introduced to the hardware industry.

*Zeos Windows systems include Lotus 1-2-3 for Windows plus Ami Pro 2.0 at no extra charge!*



# Low Cost.

Choose the Editors' Choice Upgradable. Now available as a 486-50!

*24-Hour-a-Day Toll-Free Technical Support.* While most of the others still only offer part-time technical support, as a ZEOS customer, you get around-the-clock 24-Hour-a-Day support, 365 days a year. Not that you'll need the help. But it's comforting to know if you do have a question, all you have to do is pick up the phone and give us a call, *any time* of the day or night!

And all of this is just for starters. Because when you turn the page we're going to talk about a lot of other very exciting and important reasons for you to buy from ZEOS. Like 486SX-25s, the new 486DX2-50, your ZEOS *Editors' Choice '486* and more. A whole lot more. *Come on in!*

confidence in support, in your system and in the company as well. You can buy with confidence too because ZEOS is a strong and rapidly growing public company (NASDAQ NMS Symbol: ZEOS). In fact, *Fortune* magazine rated ZEOS as *America's Fastest Growing Company.*

Price, Performance. Quality and Support. There are *many* reasons to buy your new ZEOS system. All of them backed by your ZEOS Customer Satisfaction Package which includes our 30-Day Money-Back Guarantee, One Full Year Limited Warranty and Express Parts Replacement Policy. How do you get one?

**ORDERING IS EASY!**

Ordering your new ZEOS system is indeed easy. Simply pick the

| |
|---|
| 486DX-50 $3195 |
| 486DX2-50 $2995 |
| 486DX-33 $2795 |
| 486SX-25 $2695 |
| 486SX-20 $2595 |
| 386-33 $2395 |

**INCREDIBLE ZEOS PACKAGE #3**

Add even more memory, a larger drive. And more savings! You now receive:

- 4 full Megabytes of ultra high-speed RAM.
- Our fast 130MB IDE hard drive with built-in cache.
- Teac® 1.2 & 1.44MB FDD'S!
- Diamond Stealth Hi-Color VGA card/1MB RAM (32,000+ colors) plus WinRIX drawing software!
- ZEOS 14" 1024x768 non-interlaced VGA Color monitor w/Tilt & Swivel.
- Lotus 1-2-3 for Windows, Ami Pro 2.0 with Adobe Type Manager, Microsoft Windows, DOS 5.0 *plus* a Microsoft mouse!

PACKAGE #3

# paded!

| |
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| 486DX-50 $3695 |
| 486DX2-50 $3495 |
| 486DX-33 $3295 |
| 486SX-25 $3195 |
| 486SX-20 $3095 |
| 386-33 $2895 |

**THE ULTIMATE ZEOS PACKAGE #4**

Now, memory goes to 8MB and the drive to 210MB. PC Magazine *Editors' Choice* as a 486DX-33 Vertical!

- 8 full Megabytes of high-speed RAM.
- Your screaming 210MB IDE hard drive with its own built-in cache.
- Teac® 1.2 & 1.44MB FDD'S!
- Diamond Stealth Hi-Color VGA card/1MB RAM (32,000+ colors) plus WinRIX drawing software!
- ZEOS 14" 1024x768 non-interlaced VGA Color monitor w/Tilt & Swivel.
- Lotus 1-2-3 for Windows, Ami Pro 2.0 with Adobe Type Manager, Microsoft Windows, DOS 5.0 *plus* a Microsoft mouse!

PACKAGE #4

Power and Package you want or let us custom build your new system to your exact specifications! Whatever you decide, a friendly and knowledgeable ZEOS Systems Consultant is waiting to assist you. And whatever you select, one thing is for certain.

Buying your new ZEOS system is perhaps the best purchase decision you'll ever make. So why not give us a call right now. You're going to be very satisfied. We don't just say it. We guarantee it! *Call Now Toll Free, 800-423-5891.*

ORDER NOW TOLL FREE

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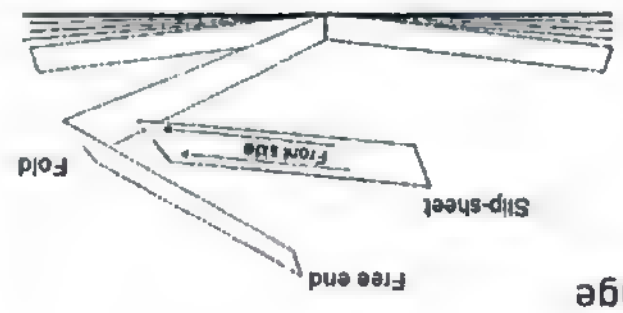


Inverted Foldout slip-sheet

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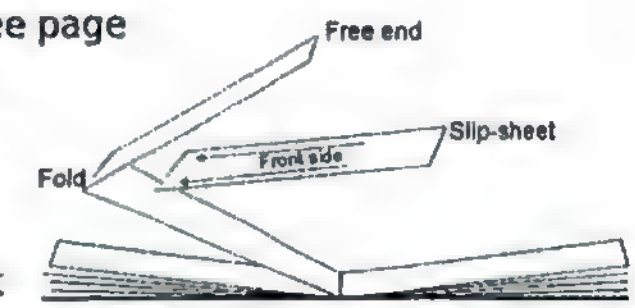

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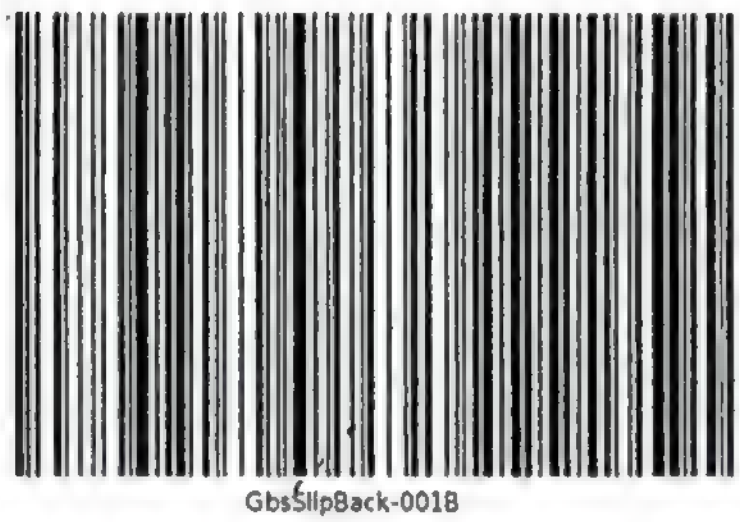


## Back

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that's ZEOS Value. Speaking of which, here's another industry first you will definitely benefit from.

**ZEOS ANNOUNCES: BUILT-IN SURGE SUPPRESSION!**

Right now, ZEOS is proud to announce that we've taken our top-of-the-line *300 watt* supply and added a *built-in surge suppressor.* Building the surge suppressor right into the power supply increases reliability and helps protect your investment. We wonder how long it will take for the rest of the industry to catch up. And while ZEOS is giving you critically important features like these, we add yet another.

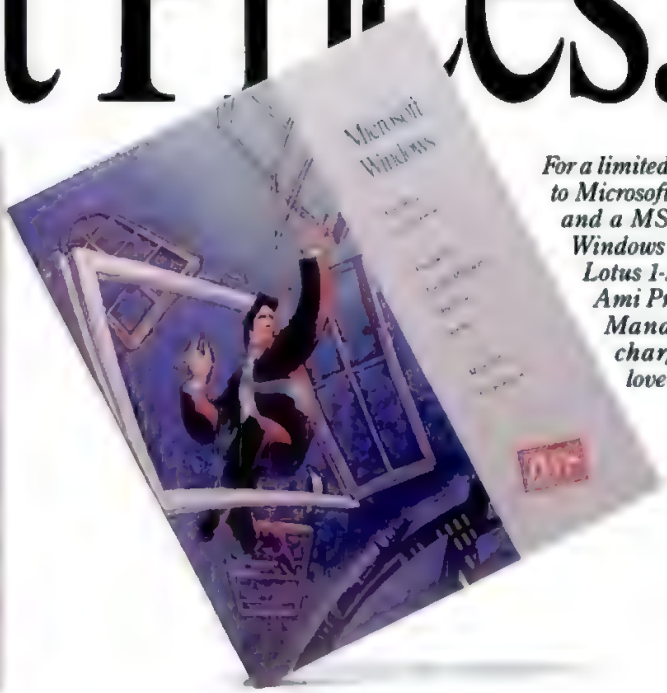
*UL® Listing!* As *PC Magazine* said, UL Listing is "one of the few forms of peace of mind you can buy." Every ZEOS system is Underwriters Laboratories Listed. This means your entire system (not just the power supply) has met the stringent safety requirements of Underwriters Laboratories. Not only that, but your ZEOS UL listing says a lot about quality too. UL safety listings are something many of our competitors simply don't (or can't) provide you. At ZEOS quality and safety are important to us. *You are important to us!*

**24-HOUR-A-DAY TOLL-FREE TECHNICAL SUPPORT.**

The importance of having you as a customer shows in many other ways as well. For example, at ZEOS we believe supporting *you* should be more than a part-time proposition. As *PC Magazine* said, "Insist on a good service and support package. Expect...24-hour seven-day-a-week support." We've been saying that for years. In fact, it was ZEOS that invented *24-Hour-a-Day Toll-Free Sales and Technical Support.* Our customers tell us they love it. And you will too. Any time you need assistance, a ZEOS technician is only a phone call away.

With ZEOS you can have complete

# Great Prices. L




*For a limited time only, in addition to Microsoft® DOS 5.0, Windows and a MS mouse, every ZEOS Windows System also includes Lotus 1-2-3 for Windows plus Ami Pro 2.0 plus Adobe Type Manager. No additional charge! You're going to love it!*

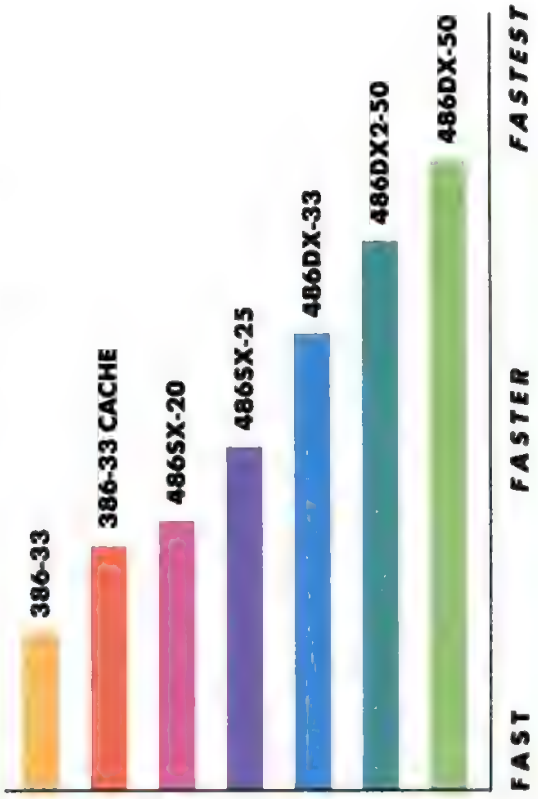
Or
Customize, Customize, Customize!
Just Tell Us and We'll Do It.

# Pick Your Power!

Now, ZEOS lets you pick exactly the power you want for the price you want to pay. Simply match the processor with the package configuration and you have your price. Or if you wish, we will custom build any system to your exact specifications.

And don't forget, with every ZEOS Windows System (packages 2, 3 and 4) you'll also receive Lotus *1-2-3 for Windows* plus Lotus's new word processor for Windows, *Ami Pro 2.0.* The Lotus software alone carries a suggested retail of over $1,000 and even street prices are over $700. Yet we're giving it to you at *no additional charge!* That's ZEOS value.

No doubt about it. ZEOS has broken the price/performance barrier with these great new upgradables,




**Z•SPEED GRAPHOMETER**

*Let the "Z-Graphometer" help you pick the processing power that's right for you. The comparisons are easy to make. Fast, Faster or Fastest!*

## ZEOS COMPLETE SYSTEM PACKAGE #1

- The processor and speed of your choice plus future upgradability!
- 1MB of high speed RAM, expandable to a system total of 32MB right on the motherboard.
- 42MB high-speed IDE hard drive with its own cache.
- 1.2MB or 1.44MB Teac® floppy drive.
- ZEOS 14" flat screen Hi-Res amber monitor with Tilt/Swivel Base.
- Shadow RAM and EMS support for enhanced performance.
- ZEOS/RS 101 key SpaceSaver keyboard.
- Two serial, one parallel & one game port built right onto the motherboard.
- 7-16, 1-8 bit expansion slots. 80387 math co-processor support for '386 systems.
- Rugged ZEOS SpaceSaver case with twin cooling fans for added reliability and product life.
- Seven drive bays and our custom 300 watt power supply with built-in surge suppressor!
- Includes ZEOS 24-Hour-a-Day Toll-Free Technical Support and Customer Satisfaction package.

## INCREDIBLE ZEOS PACKAGE #2

We take Package #1 and upgrade your ZEOS Modular System to include:

- 2 full Megabytes of rip-roaring RAM.
- Our incredible 107MB IDE hard drive with its own built-in cache.
- Both the Teac® 1.2MB *and* 1.44MB floppy drives.
- Diamond Stealth Hi-Color VGA card/1MB RAM & Sierra DAC plus WinRIX drawing software!
- ZEOS 14" High Res VGA mono monitor with Tilt & Swivel Base.
- Lotus 1-2-3 for Windows, *plus* Ami Pro 2.0 with Adobe Type Manager, *plus* Microsoft Windows and DOS 5.0, *plus* a genuine Microsoft mouse!

and you're the beneficiary. Incredible power, upgradability, and free software. What more could there be? From ZEOS, lots more.

Because your new ZEOS system is not only fast, it's absolutely loaded with features. Like our 300 watt power supply with *built-in surge suppression,* eight expansion slots, twin cooling fans for even more reliability, plus our unique seven bay SpaceSaver case. And, every ZEOS system is UL® listed.

And don't forget you're also receiving 24-Hour-a-Day Toll-Free Technical Support, our 30-day Absolute Satisfaction Money-Back Guarantee, Express Parts Replacement and more. So go ahead.

Pick your Power, your Package, and your Price and give us a call. Your friendly, expert ZEOS Systems Consultant is ready to answer any questions you may have. *Call Now Toll Free 800-423-5891.*

**PACKAGES 2, 3 AND 4 INCLUDE LOTUS BUNDLE!**

| | Pkg. #1 | Pkg. #2 | Pkg. #3 | Pkg. #4 |
|---|---|---|---|---|
| **386-33** | $1395 | $1895 | $2395 | $2895 |
| **486SX-20** | $1595 | $2095 | $2595 | $3095 |
| **486SX-25** | $1695 | $2195 | $2695 | $3195 |
| **486DX-33** | $1795 | $2295 | $2795 | $3295 |
| **486DX2-50** | $1995 | $2495 | $2995 | $3495 |
| **486DX-50** | $2195 | $2695 | $3195 | $3695 |

*Add $200 to any price for a 128K cache. 486DX-50 SpaceSaver case has 6 bays.*

**PICK YOUR PAYMENT OPTION TOO:**

When you buy from ZEOS you have a wide variety of payment options. We accept MasterCard, VISA, American Express and Discover cards, or if you wish we can ship COD.

We also have our own ZEOS credit card, the Z-Card.™ The Z-Card allows you to charge your ZEOS purchases just like a MasterCard or VISA. There is a low consumer rate and there is no annual fee. We can send you an application or you can apply right over the phone. Our special toll-free application number is 800-421-8942.

ZEOS also offers a terrific leasing program for businesses. The rates are lower than those charged by most of the others in our industry. We will promptly mail or fax you an application on request. Just give us a call at 800-423-5891.

Purchase orders from Fortune 1000 companies, governments and institutions are subject to credit approval. Wire transfer is also available. Please call 800-423-5891 for details.

**INCREDIBLE ZEOS PACKAGE #3**

**Add even more memory, a larger drive. And more savings! You now receive:**

- **4 full Megabytes of ultra high-speed RAM.**
- **Our fast 130MB IDE hard drive with built-in cache.**
- **Teac® 1.2 & 1.44MB FDD'S!**
- **Diamond Stealth Hi-Color VGA card/1MB RAM (32,000+ colors) plus WinRIX drawing software!**
- **ZEOS 14" 1024x768 non-interlaced VGA Color monitor w/Tilt & Swivel.**
- **Lotus 1-2-3 for Windows, Ami Pro 2.0 with Adobe Type Manager, Microsoft Windows, DOS 5.0 *plus* a Microsoft mouse!**

**THE ULTIMATE ZEOS PACKAGE #4**

**Now, memory goes to 8MB and the drive to 210MB. PC Magazine *Editors' Choice* as a 486DX-33 Vertical!**

- **8 full Megabytes of high-speed RAM.**
- **Your screaming 210MB IDE hard drive with its own built-in cache.**
- **Teac® 1.2 & 1.44MB FDD'S!**
- **Diamond Stealth Hi-Color VGA card/1MB RAM (32,000+ colors) plus WinRIX drawing software!**
- **ZEOS 14" 1024x768 non-interlaced VGA Color monitor w/Tilt & Swivel.**
- **Lotus 1-2-3 for Windows, Ami Pro 2.0 with Adobe Type Manager, Microsoft Windows, DOS 5.0 *plus* a Microsoft mouse!**

**ORDER NOW TOLL FREE**

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**GSA00K91AGS5176**
**Open 24 Hours a Day, 365 Days a Year!**

If you thought power like this was out of your budget, take another look. While many of the others don't even offer 50MHz power, you can own the new ZEOS 486DX2-50 starting *complete for as low as $1995!*

Starting at $1995, you can select from any of four money-saving ZEOS System Packages. Or, if you wish, let us custom-build your hot new 486-50 to your exact specifications.

**ZEOS POWER GRID FOR THE 486DX2-50**

*Apply The "Zeos Power Grid" To Match Your 50MHz Needs. Add $200 for 128K cache. Prices shown are for Intel 486DX2-50 CPU; for 486DX-50 add $200.*

| | Intel 80486DX2-50MHz | Upgradable CPU | 1MB High Speed RAM | 2MB High Speed RAM | 4MB High Speed RAM | 8MB High Speed RAM | 42MB HDD, Fast IDE | 107MB HDD, Fast IDE | 130MB HDD, Fast IDE | 210MB HDD, Fast IDE | Teac 1.2 Floppy Drive | Teac 1.44 Floppy Drive | 14" Hi Res TTL Monitor | 14" VGA Mono Monitor | 14" VGA Color 1024 x 768 NI | Monitor Tilt & Swivel | Hercules® Graphics Card | Hi-Color VGA Card, 1MB | Sierra DAC | Shadow RAM/EMS Support | ZEOS/RS 101 keyboard | 2 serial, 1 parallel, 1 game port |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Pkg. #1 Only $1995** | ■ | ■ | ■ | | | | ■ | | | | ■ | | ■ | | | ■ | ■ | | | ■ | ■ | ■ |
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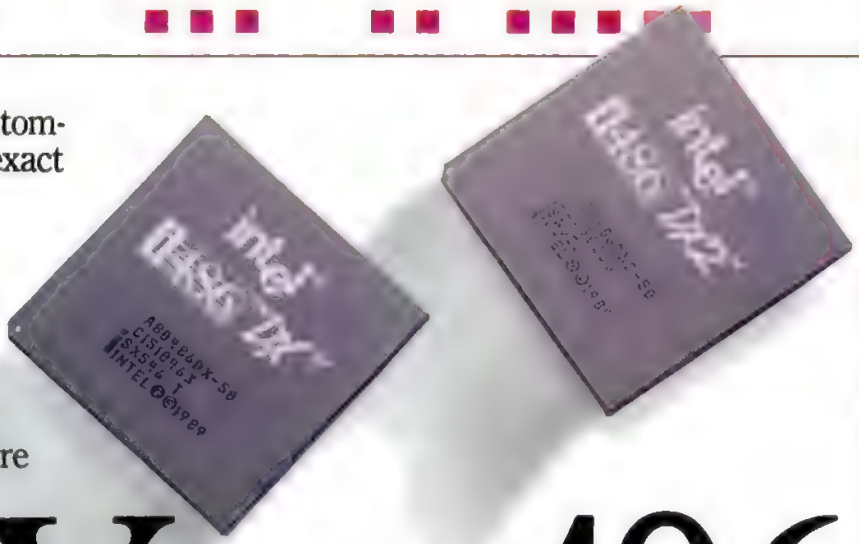


**WHAT SHOULD I GET?**

How should you configure your new ZEOS 486-50? Of course the best answer depends on your needs and what you plan to use your new system for. But never before has so much power been available to everyone at such a low price. Our suggestion would be to consider investing in two areas when you buy your new 50MHz system. The memory and drives. Particularly the memory.

From what we're hearing, memory will be important with the new operating systems debuting later this year. We would strongly recommend at least 4 megabytes, eight if it's in the budget. As for drives, think in terms of 100+ megabytes; applications just don't seem to be shrinking (however, before you go too wild, remember you can always add more drives). Both of our Packages #3 and #4 incorporate these suggestions.

Certainly another option you may want to consider is our Vertical case. This heavy-

# Your 486

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mand, and do an immediate disk write before allowing the reset. During PC Magazine Labs' testing, however, data loss was encountered when a system error caused the machine to freeze before a file was saved.

Of course, some people will be uncomfortable with any level of delayed writing because of the danger (however remote) of losing data if an error causes the system to freeze. Recognizing this, Microsoft has provided the option to turn off write-behind caching.

But write-behind caching accounts for only part of the improvement that SMARTDrive, Version 4.0, makes to disk performance. The new version of SMARTDrive is roughly four times as fast as the earlier version on the PC Labs DOS file access tests, which represent a full battery of disk operations. While the results of write tests showed the biggest gain, the file creation times were two-and-a-half times better.

The improved file access times are not totally a result of the enhancements to SMARTDrive. Microsoft fine-tuned other file I/O operations as well—some of them dramatic enough to show up in stopwatch timings. On a 486/33, we compared program loading, ensuring that the cache wouldn't be a factor by making it the first thing we did after launching Windows. We found a savings of a second in loading File Manager, and as much as 8 seconds in loading *Lotus 1-2-3 for Windows*.

Some of the disk performance improvements come from a totally new approach to disk access. The disk access technology is called Fastdrive and it cuts the amount of time Windows needs to switch from Real mode to Protected mode (which happens when you move into and out of DOS sessions from within Windows) by virtualizing the disk controller's BIOS. The benefit appears only in 386 Enhanced mode. This strategy does risk incompatibilities, but no problems were encountered in testing. Should you encounter a compatibility problem with Fastdrive, you can turn it off in Control Panel.

***Some people will be uncomfortable with any level of delayed writing because of the danger of losing data.***

To increase the number of different drives with which it's compatible, SMARTDrive is now block-oriented. It hooks into DOS at the device driver level rather than BIOS INT13 and makes disk I/O requests through the DOS device driver. As a result, some disks that couldn't be cached before, including Bernoulli, SCSI, and WORM drives, are cached by SMARTDrive, Version 4.0. Because SMARTDrive, Version 4.0, is routed through the DOS device driver, utilities


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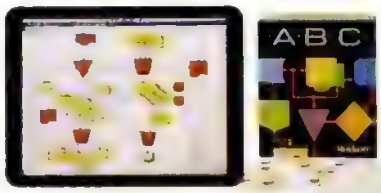


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that write directly to the disk BIOS or that require immediate disk writes (such as CHKDSK) will have compatibility problems that will be left up to the vendor to resolve.

To ensure compatibility with devices that virtualize disk addresses—including bus-mastered controllers and some memory management software—SMARTDrive can maintain a double buffer that holds both the physical and virtual disk addresses.

SMARTDrive attempts to make an intelligent installation, so if double buffering is needed, it's automatically provided. On some systems, SMARTDrive will guess wrong and install the double-buffer setting even if it's not needed, resulting in a waste of 2K or 3K. The manual provides advice on how to check if double buffering is really needed. If it's installed, there will be a double-buffer statement in your CONFIG.SYS file.

SMARTDrive will also cache floppy disk drives; you can turn off this option either at installation or from any DOS prompt. SMARTDrive, Version 4.0, is an executable program, and you can run it at any DOS prompt to check on the status of each drive's cache.

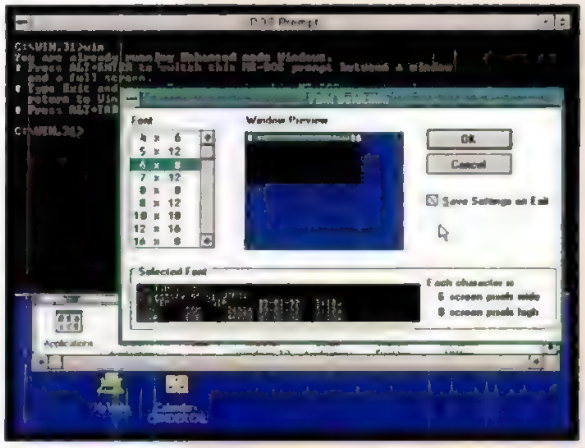
#### SMOOTHER DOS SESSIONS

DOS sessions now run much more smoothly. Switching among sessions was faster and we had no crashes in Windows 3.1 with DOS programs that used to cause total system lockups. The faster, smoother switching in 386 Enhanced mode is mostly a result of Fastdrive, which cuts down on the need for processor mode changes.

Cutting and pasting was erratic in some DOS applications under Windows 3.0; for example, sometimes key presses didn't always work quite as expected. Those problems seem to be gone in Windows 3.1.

The best new feature for use with DOS applications is a dialog box that lets you choose the size of characters in a DOS display. Choosing is easy, thanks to an intelligently designed see-it-as-you-pick-it display.

You can choose from ten different character sizes that range from a low of 4 by 6 (4 pixels wide, 6 pixels high) up to 16 by 8. As you highlight a choice, a preview display shows you the actual size of the characters and the size of the window that will be used for the DOS session. The OEM font for your video board is used for all sizes.



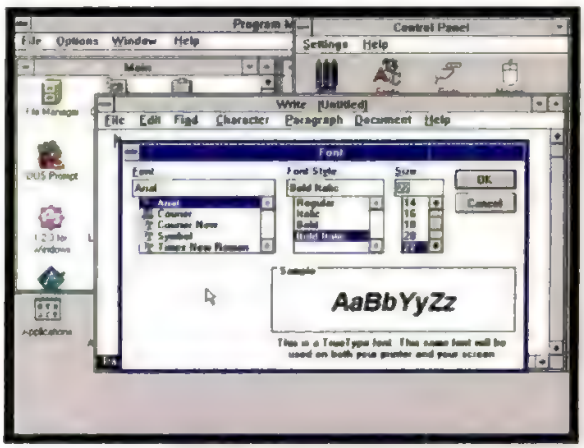
The Control menu for DOS sessions lets you change the text's font size. It will automatically adjust the window size to make the best use of your choice of font size.

Communications under DOS are also likely to be smoother. At the time of testing, Microsoft was still in the process of enhancing COMM.DRV, but the most recent version had solved the problems of dropped characters that were seen in DOS windows during 9,600-bit-per-second text transfers. On the same system where characters were dropped using Windows 3.0, no characters were dropped when using Windows 3.1.

At this writing, Microsoft was still trying to improve the communication driver's support for the 16550 UART. Windows communications programs can access the UART, but the driver was not yet able to virtualize the UART in DOS sessions. Because Windows 3.1 needs to virtualize the communications driver, DOS programs running under Windows could not use the 16550's FIFO buffer. Microsoft expects that it will distribute enhanced versions of the COMM.DRV file through its CompuServe forums and technical support within a few months.

#### FASTER PRINTING AND RECOVERY FROM PRINTING

Depending on the application and the type of job, Windows 3.0 could be very slow in printing. Microsoft's solution is TrueType, a new printing engine that uses its own scalable fonts for both on-screen display and printing.




TrueType fonts use the same scalable outlines when creating on-screen and printed characters.

You aren't forced to use TrueType; Windows 3.1 includes the bitmapped and vector fonts that never did an adequate job of displaying on-screen what would be printed. If you prefer to use your printer's hardware fonts, Windows will still generate unrepresentative fonts on-screen from the same fonts it provided in the past. However, if you select any of the TrueType fonts, you'll see an almost flawless match between display and printed output. And through the Fonts setup dialog box, you can set things up so that you see only TrueType fonts from menus.

TrueType uses the same files for generating on-screen fonts as it does for the printer (see the sidebar "TrueType: The Second Font Revolution for the Desktop"). Each character is rasterized on the fly every time it's used, so there's the potential for TrueType to be slower, but we did not find performance problems.

Short, text-only documents will print almost immediately when you use TrueType, since only the characters used in the document are downloaded to the printer. You will also get your cursor back a lot faster, since the print-preparation work is

immediately off-loaded to Print Manager. That's due to a change in the way Windows spools output for printing; it's now optimized for printing in the background.

Windows 3.1 comes with three complete TrueType font families: Arial (a Helvetica variant), Courier New, and Times New Roman. All three come in regular, bold, italic, and bold italic. In addition, there are Wing Dings and Symbol fonts in one weight. You can add new TrueType fonts from Control Panel. Microsoft's forums on CompuServe are likely to be distributing new families, and other font vendors have announced that they will be converting their libraries to the new format.

***TrueType fonts can be rotated and scaled to any point size or weight.***

Microsoft says that TrueType fonts can be rotated, though none of the software that comes with Windows can do it. TrueType fonts can be scaled to any point size (from 1 point to 500 points or more) and to any weight, moving continuously from light to boldface. The software determines how much of its capabilities you can access.

## TRUETYPE: The Second Font Revolution for the Desktop

**by Edward Mendelson**

Microsoft Windows 3.1 makes scalable fonts part of the operating system; your printer will never be the same. TrueType, Windows' new built-in font technology, offers superior output, speed, and ease of use compared with add-on WYSIWYG font technologies like those in *Adobe Type Manager* and Bitstream's *FaceLift*.

TrueType won't supplant PostScript as the preferred font technology for high-end graphics design and can't match PostScript's cross-platform compatibility (you can use TrueType only from the Windows and Macintosh environments). However, nothing else presently available on the desktop offers the speed and convenience of TrueType's screen and printer fonts.

Because TrueType is part of the operating system and not an add-on utility like *Adobe Type Manager*, it renders fonts on-screen at top speed, and works transparently with almost any application. As with *Adobe Type Manager*, you can choose any size you like; if the size isn't listed on your application's menu, just type the number into the Size box.

TrueType adapts itself to your printer in ways that no other font-scaling program attempts to do. If you use a Hewlett-Packard LaserJet, for example, Windows generates a PCL 4 font from a TrueType scalable outline and downloads it to the printer; this method produces the fastest and most efficient output possible. By contrast, other font scalers such as *Adobe Type Manager* and Bitstream's *FaceLift for Windows* generate all characters as individual bitmaps. (*Facelift for WordPerfect* downloads a PCL 4 outline.) You can still use these font-scaling add-ons with Windows 3.1, and if you upgrade to *Adobe Type Manager*, Version 2.0, you can mix *Adobe* and *FaceLift* fonts with TrueType fonts.

If you use a PostScript printer, Windows sends TrueType fonts to the printer either as unhinted Type 1 PostScript font outlines or as bitmaps. The Type 1 outlines print faster than the bitmaps but with lower quality at small sizes.

Windows 3.1 comes with 13 Monotype-designed TrueType fonts: four weights each of Times New Roman, Arial (a more graceful and lively variation of Helvetica), Courier New, and a Symbol font. Each font looks sharper and smoother than Adobe's corresponding PostScript fonts, and produces better 300-dot-per-inch output at smaller sizes than any other scalable font package on the market.

But the superb quality of these core fonts doesn't mean that other TrueType fonts will surpass their PostScript counterparts. Monotype devoted months to fine-tuning these 13 fonts. Fonts that other vendors rush to market—especially fonts hastily converted from other formats—may be much lower in quality. To gain TrueType's speed and convenience, you can convert PostScript and other fonts to TrueType format using programs like Atech's *AllType*, but the quality of the converted font will be lower than the original, because it's mathematically impossible to make an exact conversion from other formats to TrueType.

The Windows Control Panel lets you install additional TrueType fonts effortlessly, including a 48-font TrueType Font Pack from Microsoft. Unlike many other formats, TrueType uses only a single font file; Windows creates a font metric file when you install the font, but you don't have to copy it if you copy the font file.

TrueType isn't the only improvement in font handling in Windows 3.1. The new standard Windows character set adds 22 symbols to those in earlier versions, and you can use these characters with all font technologies, not just TrueType. Windows used to let you choose bold or italic without telling you if you really had bold or italic fonts; if you didn't have them, Windows created crude equivalents. Now, Windows lets you choose fonts that really exist, and gives you easy access to fonts with attributes like semi-bold and light.

If you have a large investment in PostScript Type 1 fonts, you won't be tempted to replace them with TrueType. *Adobe Type Manager* already gives you WYSIWYG screen fonts and printer fonts that you can use with any printer, although less efficiently than TrueType. PostScript also runs on more platforms than TrueType (and *Adobe Type Manager* is built into OS/2 the way TrueType is built into Windows), and has thousands of fonts already on the market. But TrueType makes scalable fonts instantly available to every Microsoft Windows user—effortlessly and quickly. PostScript began the first generation in desktop typography, and TrueType initiates the second. ■

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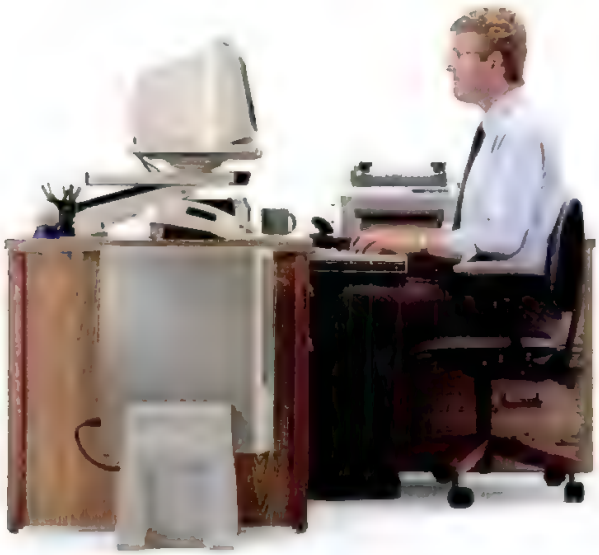

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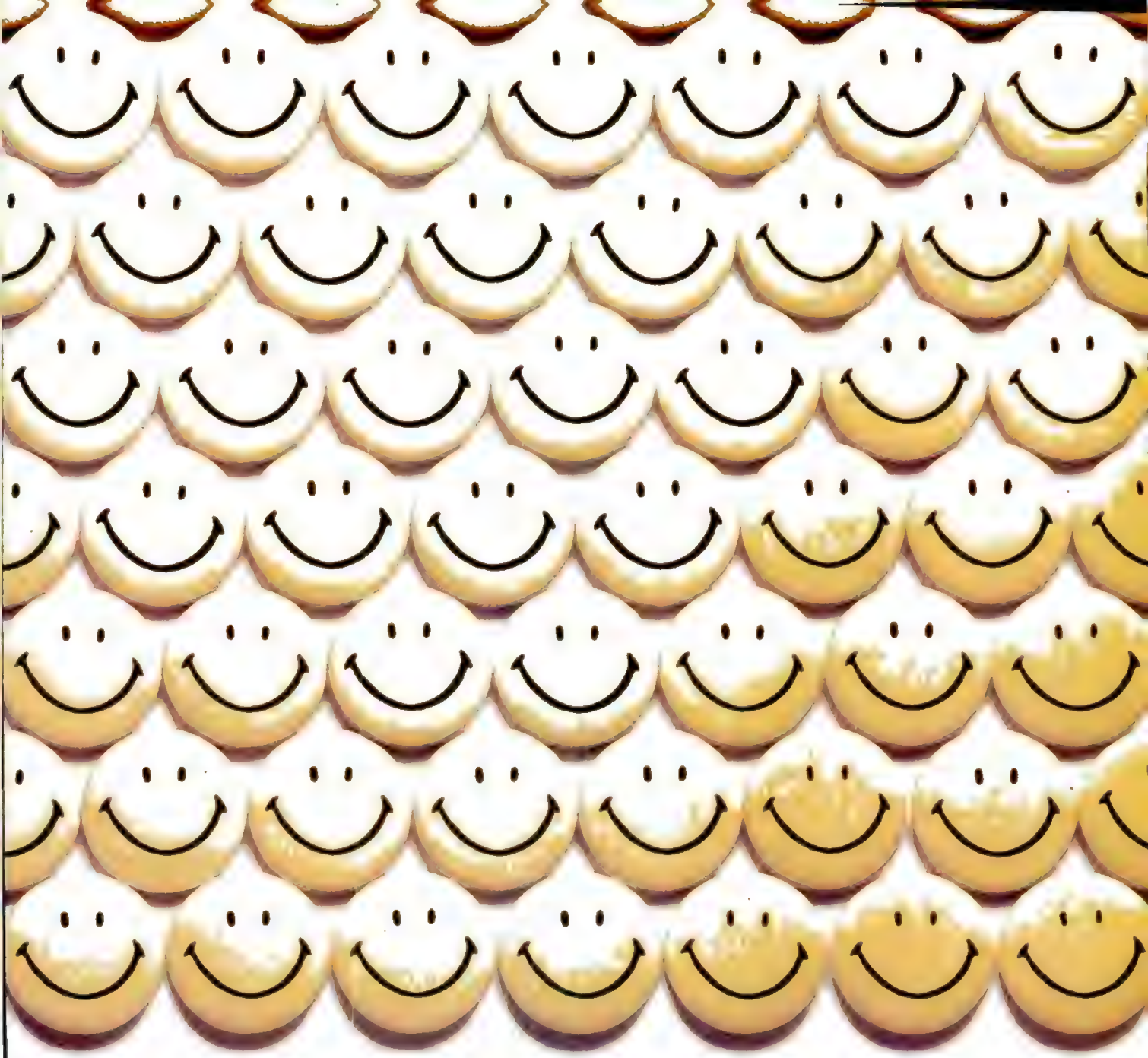

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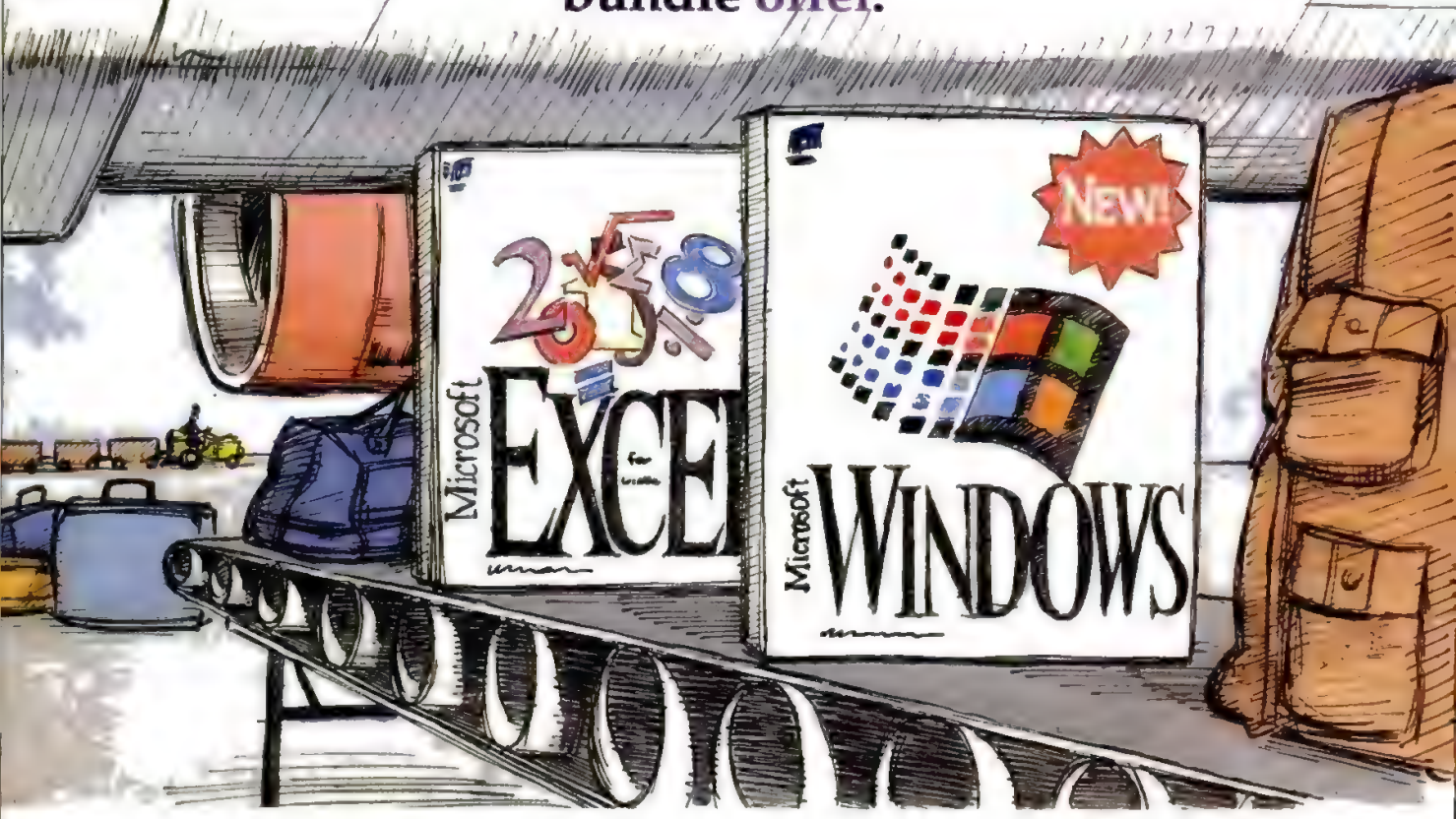


## Buy Windows 3.1 with a Microsoft mouse and Excel for Windows 4.0 for just $449 and receive a Windows 3.1 audio training package, free.

From now until June 30, 1992, Software Spectrum is offering special bundle pricing on the two latest arrivals from Microsoft®. New users can buy Windows™ Version 3.1 with a serial or bus Microsoft Mouse and Excel Version 4.0 at the terrific Software Spectrum promotional price of just $449 and receive a Windows 3.1 audio training tape and manual from Personal Training Systems, absolutely free. Existing users can upgrade to these new releases for an upgrade bundle price of just $142 and still receive the training tape free.

Windows 3.1 turns your PC into a graphically-oriented, multi-application environment with the point-and-click simplicity that is Windows. And the new clipboard makes cuts, copies and pastes between applications easier than ever.

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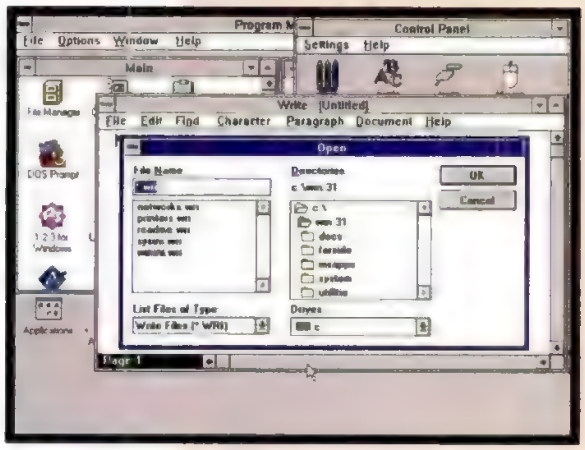
But don't be fooled by the limited number of point sizes presented to you in an application's menu. For example, although the Write menu presents you with only 16 point sizes, you can actually type in any size you want.

TrueType all by itself is an improvement that makes Windows 3.1 worth the upgrade. If you're a committed fan of *Adobe Type Manager* or Bitstream's *Facelift*, there's little reason for you to change horses. But TrueType is a godsend for anyone who has not made a big investment in fonts, or for people who have soft fonts that aren't represented by display fonts.

If you have a significant investment in soft fonts, you may want to use one of the newly introduced font converters that let you convert soft fonts to TrueType. Or ask your fonts vendor if he has an upgrade offer for buying TrueType versions of the fonts.




The File Open dialog box is an example of what Microsoft calls common dialog boxes: a basic design that is used for a wide variety of file-access commands.

#### BURIED TREASURES

In addition to SMARTDrive, TrueType, OLE, and the increased stability with regard to system-halting errors, there's a treasure trove of improvements sprinkled throughout Windows 3.1. Many of them are small changes that will seem like little gifts. Common dialog boxes make file access simpler at almost every turn. New key combinations have been added for regular chores, and a host of customization options have been added.

#### COMMON DIALOG BOXES

The common dialog boxes appear in all of the Windows accessories and within Program Manager, and you can expect them to appear in other applications as they're revised.

New designs are provided for file functions (open, save, import, and so forth), font selection, and printer setup. The dialog boxes that provide file functions have drop-down lists for all drives, use file folder icons for subdirectories, and have default settings for viewing only the data files recognized by this program.

The dialog box is so well laid out that it helps to overcome Windows' file management problems. You still can't easily copy, move, or delete a file in Windows without loading File Manager or shelling out to DOS, but the new file access dialog boxes put you closer to your files. The visual representation of the directory tree is a welcome relief from the older design where [..] was the most popular directory.

The file function dialog box design is used by many programs for browsing among files. For example, the Program Manager's Properties command lets you use a dialog box to Browse for executable files. The font dialog box is a monumental improvement. As you select a font, size, and style, you see a sample. When you've selected a TrueType font, not only do you see a "TT" logo next to the font name, the sample display includes a legend that tells you that it's a TrueType font. When you choose one of the Windows bitmapped or vector fonts, you see another message, warning you that the displayed font may not match the printed output.

#### SMARTER KEYS

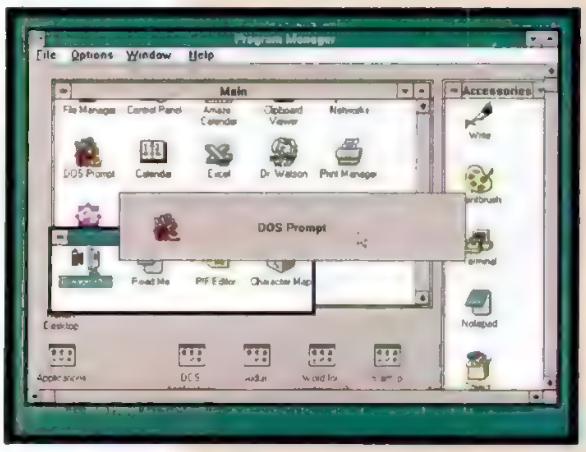
One of the nicer small touches is better use of shortcut keys. Previously, the Alt-Tab combination would switch between the two most recent programs. With Windows 3.1, this combination has been enhanced to make it easier to switch among open programs. To use it, hold down the Alt key and then tap on Tab repeatedly; with each new press of Tab, a message board pops up with the name and icon of one of the programs in memory, including DOS sessions. When you see the program you want, release Alt and that program becomes active.

The Alt-Enter combination was previously used to switch a DOS session between a window and full screen. Now when your cursor rests on a program icon, Alt-Enter can also be used to edit the icon's properties.

You'll probably find yourself editing program item properties more frequently, since several dozen new icons are included. Many of them are accurate representations of the logos for DOS products. Program icons can also be more informative since their text labels can be two or three lines. Long labels will wrap automatically, eliminating the problem of overlapping icon labels.

#### CONTROVERSIAL KEYS

One of the more controversial changes made in this upgrade is the addition of Macintosh-compatible cut-and-paste keys, which first appeared on PCs in *Word for Windows*, Version 2.0. While Windows will continue to work with the current set (Shift-Del for Cut, Ctrl-Ins for Copy, and Shift-Ins for Paste), the Accessories in this version support a new set: Ctrl-X for Cut, Ctrl-C for Copy, and Ctrl-V for Paste. The new shortcut keys are




The Alt-Tab key combination makes it easier to switch among open programs, including DOS sessions. When you see the message board for the program you want, release Alt and the program will become active.

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listed on the Edit menu, though you can use the old or new keys interchangeably. For example, you can cut a block of text by pressing Ctrl-X and then paste it using Shift-Ins.

The keyboard command changes are clearly there to help Microsoft turn Windows into a portable environment that will run in the same way, whether the underlying system uses a RISC or Intel processor, and whether it is made by IBM, Apple, Sun, or a player to emerge later. The switch may take years to complete, since other Windows applications will have to be revised to get in line with the new system. It will probably take your fingers a long time to make the adjustment, since you'll have to use the old shortcut keys in other Windows programs.

#### THE START OF SOMETHING LOUD

One of the new accessories, Sound Recorder, provides more than a way to use OLE; it represents the official beginning of sound as a mainstream type of media on a PC.

You'll need some kind of sound card—ranging from a $100 Sound Blaster to full-blown MIDI systems—to make the most use of it, but you can play sound files using the Sound Recorder accessory and link them to Windows events even if your only audio device is your PC's built-in speaker.

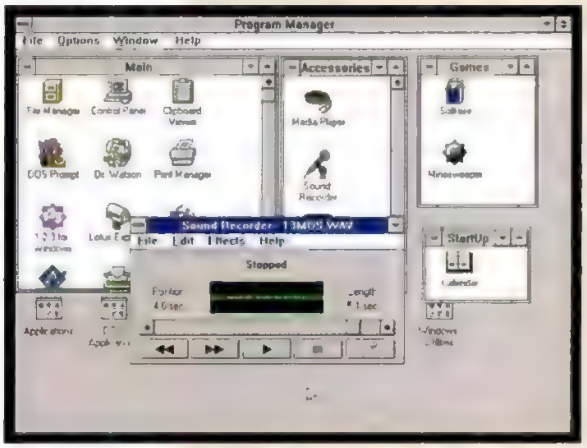
In Windows, Version 3.0, users were totally reliant on the Multimedia Extensions to furnish the hook into Windows' sound capabilities. Windows 3.1 incorporates most (but not all) of the full Multimedia Windows specification. If you buy a Multimedia Windows device, a CD-ROM player, for example, you'll get the additional drivers (Multimedia Extensions). At press time, the only way to install the Multimedia Extensions for Windows was to first add them to Windows 3.0, and then upgrade to Version 3.1. Microsoft has promised to serve up a better solution when 3.1 ships.

The PC speaker driver was not fully debugged by press time, so Microsoft was planning to make it available through its CompuServe forums and on request through technical support. It was working in early versions, however, and although the PC speaker's quality is poor, it did a commendable job of playing the four .WAV files included. (.WAV is the Windows-supported waveform file format.)

With a Sound Blaster, Ad Lib, or any other supported device, you can record sounds and then use cut-and-paste to insert the recording into an OLE client application. That means that with only three shortcut key presses, you can link a recorded sound into a Write document. The recorded sound will appear in your document as an icon; double-clicking on the icon will launch the program that plays it.

Microsoft also added seven sound program calls to Windows 3.1 and, through a Control Panel option, you can link specific sound files to Windows operations. Among the Microsoft defaults are a trumpet-like "ta-da" at Windows startup and a "ding" to accompany error messages.

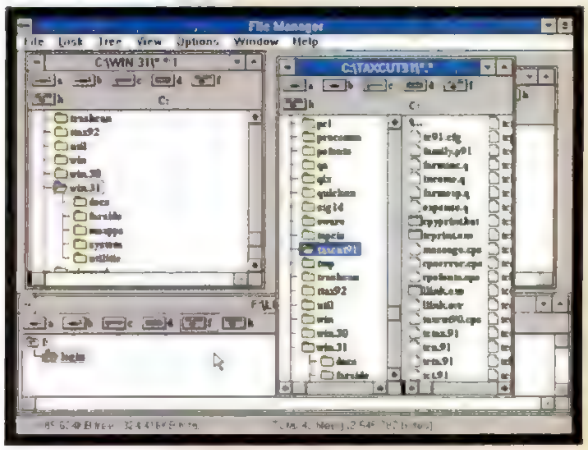
The Sound Recorder provides a very useful set of basic cutting and mixing commands. So, with a sound card and a microphone, you'll have a good start on a toolkit for recording your own musings or building a library of sound effects. The Sound Recorder's availability as an OLE server and the new sound program calls will probably make the workplace much livelier.




**The Sound Recorder can play, cut, mix, and overdub audio files. Its interface is modeled on a tape recorder. In addition, Windows 3.1 comes with a Media Player, which is modeled on a CD player.**

#### A BETTER, BUT NOT YET PERFECT, FILE MANAGER

Microsoft has made significant improvements to File Manager. As a result of the improved disk performance and some significant code fixes, it loads much more quickly than in earlier versions. However, it still seems overly complicated and cumbersome.




**File Manager runs faster and has more customization options, but it's still a cumbersome tool to use for everyday disk-maintenance chores.**

While copying and moving are easy enough, you need to take too many steps for most other actions. For example, when you want to look for a file, you must first change your default directory to ensure that you're looking at a wide enough area of the disk. You don't often hunt for a file within a subdirectory; you search the entire disk.

And, as in the earlier version, some keys work differently depending on which part of the screen is active. For example, the right arrow key opens a subdirectory when your cursor's in the Directory Tree window, but when you're in the Directory Contents window, the right arrow key merely moves you to the file at right, even if the cursor is resting on a subdirectory.

File Manager is too dependent on menu commands and dialog boxes. It could benefit from some icons. Here's one case where Microsoft would do well to look at other vendors' technologies. File Manager needs Smart Icons.

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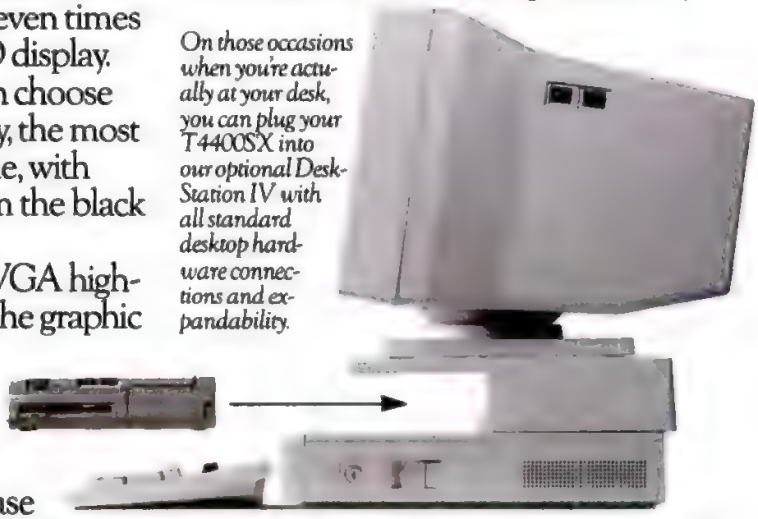

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with File Manager in time, but the learning curve seems too steep for a disk-management utility. The new File Manager makes *The Norton Desktop for Windows* look better than ever.

You may find yourself using it more, however, to get the full benefit of OLE. When data files are properly packaged, you have amazing customization options from within File Manager. When data files are associated with programs, you get Macintosh-like drag-and-drop capability. A .BMP graphics image dragged to a minimized Print Manager icon will be immediately printed, using Paintbrush's printing control automatically. A sound file dragged to a minimized Sound Recorder icon will be immediately played.

File Manager has added a quick disk format command and lets you change the display fonts. (It still has no Undelete command.) One welcome new feature is that your previous settings are saved, including the directories last used, so if your file management work usually involves the same directories, File Manager will save time for you every time you load it.

### A GROWING AWARENESS OF NETWORKS

When Windows 3.0 was introduced, there were numerous problems on *NetWare* networks. The problems disappeared after Novell upgraded the *NetWare* driver and shell. This time, Microsoft and Novell are working together to avoid a repetition of the problem. In addition to making sure upgrades will be available for leading network operating systems as soon as Windows 3.1 is released, there's significantly more help in the Windows manuals on installing and maintaining Windows on a network.

***OLE packages can give you amazing customization options. You can associate data files with programs for Macintosh-like drag-and-drop capability.***

The exact options available depend on your network and the driver set that you're running. In the version we tested with *NetWare*, Control Panel's Network module provided settings for enabling or disabling network messages, controlling network printer buffers, and it included an option for automatically reconnecting at Windows startup.

### SMARTER SETUP

Installing Windows has become a sideline for many people, whether it's in helping others or fine-tuning their own setup. If you're one of these people, you will find that the Setup program offers a big improvement.

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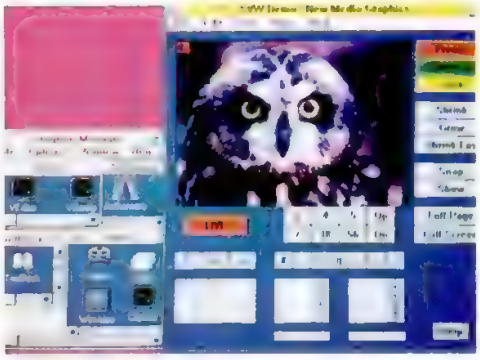

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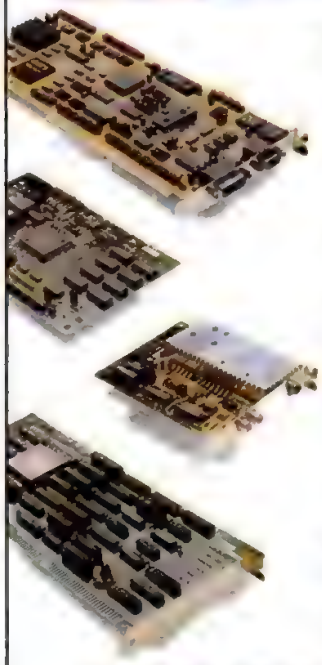

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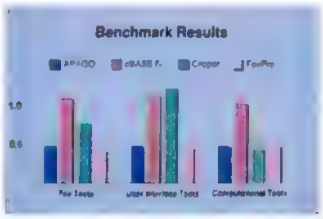


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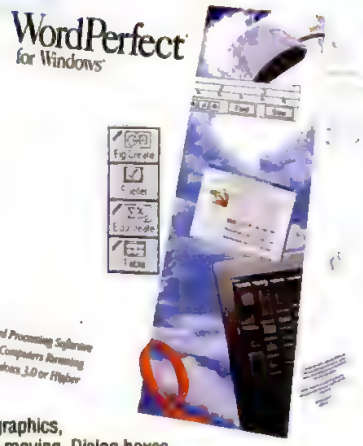


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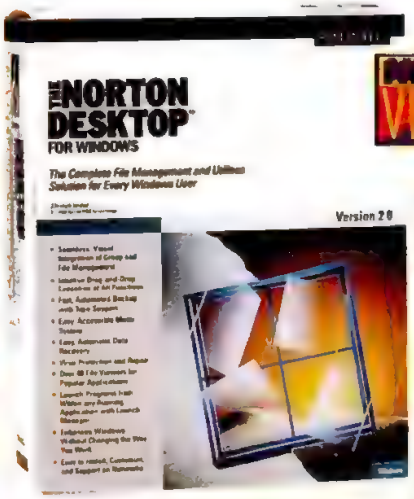


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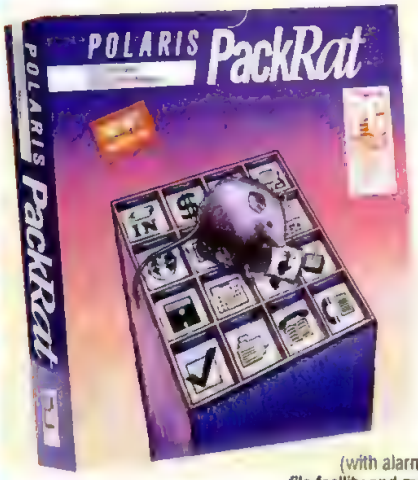


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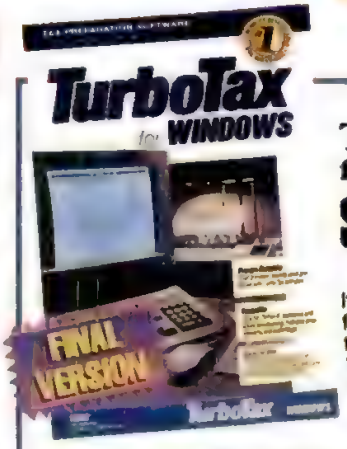


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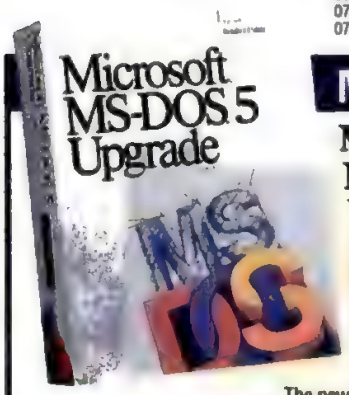


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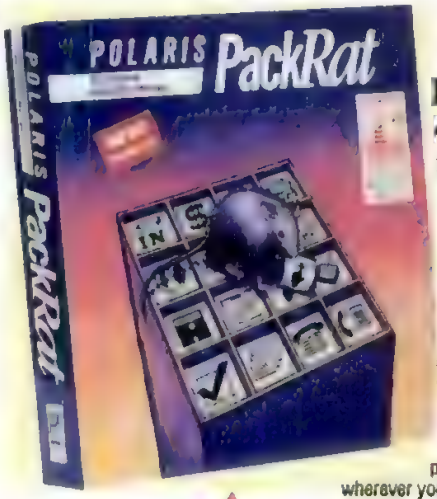


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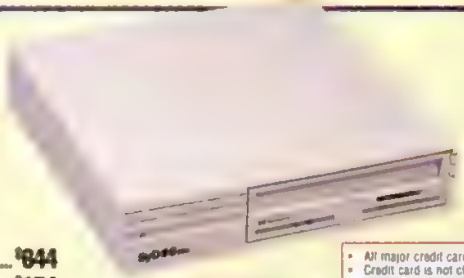

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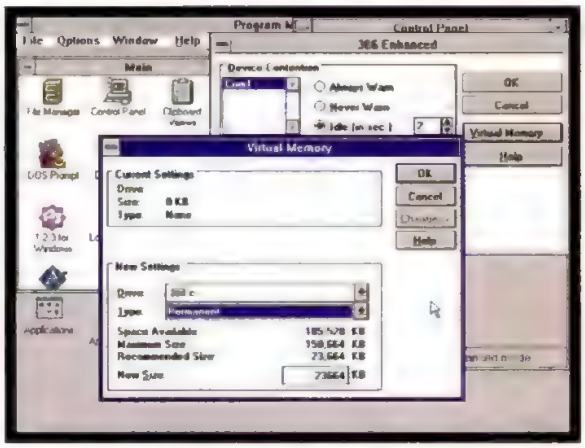
There's a choice of custom and express installations. Custom lets you keep the use of disk space to a minimum by choosing which nonessential programs are installed. The Express setup gives you everything, including all of the Accessories, help files, and a tutorial designed for people who haven't even touched a mouse before.

Setup also gives you the option of creating an entirely new directory for Windows 3.1 and leaving your old version untouched. You may be tempted to take this option so that you can explore the new version before you decide if you want to keep it, but there's no reason to be so conservative. By installing it over the old version, you'll retain the settings you've put in place, such as wallpaper, program groups, and opening screen positions. Also, Setup will delete many of the older files that are no longer needed.

When installed on a new system, the default Main and Accessories have roughly the same programs as before, with a few additions. The Games group consists of a largely unchanged Solitaire and a new game, Minesweeper, which is a "pick the pegs" type game where you try to beat the clock. Reversi is gone, though if it's on your system and you choose the Setup option that upgrades over your existing Windows directory, it will stay in your games group.

There will be less reason to tinker with your DOS configuration files, AUTOEXEC.BAT and CONFIG.SYS, after installation, since SMARTDrive 4.0 allocates available memory automatically.




**Setting up a swap disk is much easier in Microsoft Windows, Version 3.1, thanks to the Virtual Memory option in the Control Panel's 386 Enhanced module.**

You can override the defaults with switches, but you probably won't need to.

### SOME THINGS HAVEN'T CHANGED... AT LEAST NOT MUCH

Much has been left alone. PIF Editor, Notepad, SysEdit, Recorder, Calculator, and Calendar are virtually unchanged.

Cardfile is enhanced only by its ability to act as an OLE client. Write's font menu has been cleaned up and it can act as an OLE client. Clock has several new options, including a choice of fonts. Terminal is little changed, except for the sorely needed addition of new fonts.

The Help system has been improved overall with a more streamlined structure. And the Help files available for individual programs often have clearer, more readable instructions. There's also an extensive use of hypertext-style help that lets you highlight an unfamiliar term to see a definition immediately.

### A HEALTHY CONTROL PANEL

Control Panel has a smorgasbord of new features, starting with the addition of new color schemes. Four color schemes for laptops are provided, including separate choices for LCD and gas plasma screens. There are eight new screen areas that can be colored, including button face and grayed-out text.

The 386 Enhanced mode options let you control the swap file, giving you control over its size and whether the file is permanent or temporary. Permanent files must be stored on contiguous areas on your hard disk and have the advantage of speed. However, they can't be installed on network drives. If you want to install your swap file on a network drive, you must choose the temporary file option.

The Mouse options include the ability to add trails to make it easier to follow the mouse pointer on a laptop. When you use mouse trails, you'll see four or five mouse pointers whenever you move the mouse, an effect that helps overcome the slow refresh rates of LCD screens.

The Desktop module provides a choice of screen savers with password protection. Among the choices are a star field simulation and a marching marquee that can display a text message. There are a few new wallpaper choices but nothing sensational. In fact, with the exception of a 256-color shiny ball, all of the new wallpaper images are very conservative and require small amounts of RAM.

### WHY WAIT?

Microsoft began testing Windows 3.1 in June 1991, using a large-scale beta program that was modeled after the one used to debug DOS 5.0. As a result, there's little reason to delay in upgrading. System-halting errors (also known as UAEs) are much less frequent, and any problems that still exist are likely to be solved by updating the offending programs, rather than by updating Windows. It's unlikely that there will be an upgrade to Windows 3.1 any time soon.

The next enhancement to Windows will come from the 32-bit version, Windows NT, which is being designed to work across platforms and will require a 386 processor (see the sidebar "Windows NT: The Next Big Step for Windows" in the OS/2 feature in this issue).

The basic story on Windows remains unchanged with this revision. You still need plenty of disk space and plenty of RAM—and it will help to have the fastest processor and video board you can afford. But with Windows, Version 3.1, Microsoft has looked at everything that people liked about Windows and given us more of it. If you've felt that using Windows has been a struggle, your faith has been rewarded. ■

*Edward Mendelson is a contributing editor to* PC Magazine. *Gus Venditto, also a contributing editor to* PC Magazine, *is the author of* PC Magazine Guide to Windows 3.1 *(ZD Press).*

**FACT FILE**

**Microsoft Windows, Version 3.1**
Microsoft Corp., One Microsoft Way, Redmond, WA 98052; 206-882-8080.
**List Price:** Not available at press time.
**Requires:** 286-based PC or better, 1MB RAM (2MB recommended), 10MB hard disk space, EGA display or better, DOS 3.0 or later.
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# OS/2 2.0: Does It Fulfill the Promise?

**A "better DOS than DOS," a "better Windows than Windows," and a better operating system than the rest of them. Will IBM regret the day it made these claims, or does OS/2 2.0 rise to the challenge?**

ILLUSTRATION: COCO MASUDA

by Joe Salemi

It's become an industry joke that the next version of OS/2 will be the "real one." Well, the next version is here. *PC Magazine* recently looked at a version of OS/2 2.0 that was days away from scheduled release and found that it answered most but not all of the concerns that people have about the new operating system. The release has everything that was promised for OS/2 2.0 early on: multiple large DOS sessions, the ability to run Windows applications in a window on the OS/2 desktop, full-screen sessions, and support for a wide range of systems.

In addition to OS/2 2.0's being a full multitasking, multiheaded operating system that relies heavily on 32-bit code, IBM has been claiming that OS/2 2.0 would be a "better DOS than DOS" and a "better Windows than Windows." Judging from what we have seen, the

"better DOS than DOS" is here. The better "Windows than Windows" may be an unreachable goal, but OS/2 2.0 is close to being a workable Windows environment. Equally important, OS/2 2.0 provides a new user interface through its Workplace Shell and a more object-oriented approach to file and application management.

*OS/2 2.0's new Workplace Shell is highly iconized and object-oriented.*

### BOTH AN OPERATING SYSTEM AND A GUI

People often talk about OS/2 2.0 and Windows 3.1 in the same breath, but it is important to remember that OS/2 2.0 is a new operating system as well as a new graphical user interface (GUI), while Windows is a GUI that runs on top of DOS. There are some important differences between the OS/2 operating system and DOS. OS/2 2.0 takes full advantage of the 32-bit and virtual-addressing capabilities of 80386 and 80486 chips, giving it many capabilities that DOS lacks. The most important of these is OS/2's bulletproof memory protection, which prevents one application from bringing down your whole system.

But the cost of this operating system comes in heavy resource requirements. According to the documentation, OS/2 2.0 requires a minimum of a 386SX processor, 4MB of RAM, and a 60MB hard disk. While OS/2 2.0 can run on the minimum configuration, we found that at least 6MB of RAM enhances performance.

Another consequence of OS/2's being both an operating system and a GUI is that installing OS/2 is a bigger job than installing Windows. Our copy came on 21 1.44MB floppy disks: 15 hold the operating system and GUI, and the remaining 6 contain printer and screen drivers. OS/2 2.0 installation is automated but tedious. The process takes from 30 to 45 minutes, depending on the number of options you install, and it involves a lot of disk swapping. Installing just the bare-bones system, without DOS or Windows support, takes up a minimum of 15MB of disk space. Installing everything, including the system-trace and debugging programs, brings the requirements up to almost 30MB. Realistically, OS/2 2.0 will eat up about 18MB to 20MB of disk space on an average system.

### OS/2'S NEW LOOK: THE WORKPLACE SHELL

The most obvious difference between OS/2 2.0 and previous versions is the new user interface: the Workplace Shell (WPS). The Presentation Manager (PM) Desktop interface used in Versions 1.1 through 1.3 bore a strong resemblance to Windows; everything was accessible through a series of grouped programs, and icon use was limited. The WPS is highly iconized and object-oriented; it resembles the Macintosh's interface more than the other PC-based GUIs. For example, the name of an icon can be changed simply by clicking on it with the right mouse button while holding down the Alt key.

WPS windows have more of a three-dimensional look than either Windows or Presentation Manager, particularly in the buttons on the drop-down menus and dialog boxes. And the window frame is different: The System Menu bar in the upper-left corner has been replaced with a small representation of the icon assigned to the folder or application, and the sizing buttons in the upper-right corner are indicated with small and large squares instead of arrows. When an application is minimized, it can be either shrunk to an icon in a special folder on the Desktop or rendered invisible so as not to clutter up the screen. A pop-up Windows List replaces the Task Manager, and invisible applications can be made visible by clicking on them there.

The WPS also lets you set the color schemes right down to individual windows, which is completely unlike the global color settings in Windows or Presentation Manager. Since the default and optional color schemes included are dull (to put it mildly), most users will want to create custom schemes for their own use.

### OS/2 DESKTOP: THE NEW ORDER

Instead of the groups used by the PM Desktop and Windows, the WPS uses folders to represent collections of objects such as programs and data files. The primary folder (and the first one the user sees) is the Desktop, which serves as the root folder for all the others. A number of folders are created during installation, such as the OS/2 System folder, which holds all the system controls. Among the other folders created at this time are those containing the included applications or "applettes" (more on these later) and the Information folder, which contains the on-line reference manuals for REXX (IBM's powerful batch programming language), the OS/2 commands, and a tutorial. Other items on the Desktop are the icon for the Master Help Index, which has complete on-line help for OS/2, DOS, and Windows, and a Start Here icon as a beginner's guide to basic functions. There is also an icon for the print spooler. The Shredder icon is equivalent to the Macintosh trash can; dropping an object's icon on the Shredder deletes it from the disk.

**OS/2 2.0's main user interface is the Workplace Shell (WPS) Desktop, a completely icon-based interface that replaces the Presentation Manager from Version 1.x. The differences between the two are most obvious in the DRIVES application, which is the WPS replacement for the File Manager.**

If the installation process finds any preexisting DOS or Windows applications on the hard disk, a Migration utility is run to let the user add the programs to DOS and Windows folders on the Desktop. The Migration utility can be run any time. New DOS or Windows applications are installed, since these will not auto-

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matically appear on the Desktop.

The last folder on the Desktop is the Templates folder. The Templates folder is very important because the templates are used to add new objects, such as folders and applications, to the Desktop or other folders in the system. You can create new objects by making a copy of the appropriate template in the place where you want the object to live and then filling out the various settings that describe the particular object: its screen settings (window versus full-screen, for example), associations with other data or program objects, and icon. Another new feature is shadowing; this gives the user the ability to have multiple icons in multiple folders that all refer to the same object. An icon editor is included so you can create your own icons if the program does not have its own or if you do not like the default.

**Complete documentation is available on-line. Help is available through the Help option on each window or through the Master Help Index. Reference manuals for REXX and the OS/2 commands, as well as a tutorial, are accessed through the Information icon on the Desktop.**

#### AN OBJECT-ORIENTED DESIGN

Every object is configurable through its settings screens, which are accessed through the object's system menu. This powerful and flexible design allows the user to create associations between data files or other objects and applications. For example, you can create a folder of all data files that pertain to a particular project and then associate each data file with the application that created it. When you click on the data file, the appropriate application is launched and the file is loaded.

An additional settings screen is available for DOS and Windows programs that lets the user set more than 25 different parameters for a particular program's session. Among other settings, these parameters control the amounts of conventional, LIM EMS, and XMS (extended memory specification) memory available to the application, whether the application should have exclusive control over the mouse, and whether it needs DPMI (DOS protected-mode interface) services. You do not have to remember where a particular program or data file is on the hard disk when using the settings screens. You can browse the disk and then click on the filename when you find it; the filename will be automatically entered in the settings screen.

#### IMPROVEMENTS IN VERSION 2.0

OS/2 2.0's use of virtual memory is much more efficient than that of OS/2 1.*x*, mainly because Version 2.0 uses the 80386's ability to swap out a 4K page at a time, instead of the full 64K segment that the 80286 required. The SWAPPER.DAT file (where the pages are swapped) is also dynamic; the file grows and shrinks as needed, instead of constantly growing as it did in past versions. For systems without a numeric coprocessor, OS/2 2.0 will install an emulator.

OS/2 has two hard disk caches: one for file allocation table (FAT) disks and one for High Performance File System (HPFS) disks. The HPFS has had write caching (lazy writes) in addition to read caching since the introduction of HPFS with OS/2 1.2. Now the FAT cache, which is built into the operating system, also has optional lazy-write capability. The improved memory management, coprocessor emulation, and write caching all translate into a faster OS/2.

OS/2 2.0 continues the built-in support for *Adobe Type Manager* fonts that started with OS/2 1.3. IBM has not made any official statements on TrueType support at the time of this writing. In addition, the ability to set the font size in OS/2 windows running text applications has been extended to include DOS windows.

The on-line reference manuals found in earlier versions of OS/2 are still present. As before, these contain complete OS/2 documentation from settings to commands.

SCSI (small computer system interface) support has also been improved. Earlier versions of OS/2 required owners of SCSI drives to get the correct drivers from their card vendor. The SCSI drivers in OS/2 2.0 are designed to be generic and will work with virtually all SCSI drives. CD-ROM support and explicit support for Adaptec and Future Domain SCSI Devices have also been added.

The File Manager in OS/2 1.*x* has been replaced with the Drives icons. The Drives icons treat each disk as an object and let you manipulate the contents of the disk directly in its own window without having to load one master application and switch from disk to disk. As individual directories and files are also treated as objects, each can be copied or moved between different disks and folders by dragging its icon to the destination. Dragging a file's icon to the Shredder deletes it; dragging it to the Printer icon prints it. Finally, network support is improved through the internal LAN route. LAN drivers register

## OS/2 AT A GLANCE

***The Five Best Aspects***

1. OS/2 is a true 32-bit operating system.
2. A fully implemented protect mode makes OS/2 very stable.
3. Multiple DOS sessions can take advantage of EMS memory and XMS memory.
4. DOS compatibility is excellent.
5. "Applettes" distributed with the OS/2 program provide plenty of functionality.

***The Five Worst Aspects***

1. OS/2 2.0 is a resource hog, both in terms of RAM and disk space.
2. The new Workplace Shell will require some relearning.
3. Ctrl-Alt-Del reboots your computer without giving you the option to close only the offending application.
4. No native OS/2 2.0 applications yet exist.
5. OS/2 2.0 cannot run Windows applications in Enhanced mode or 32-bit Windows applications.

themselves with the internal router, which provides seamless integration of LAN resources with local resources on the WPS Desktop.

**BUT WAIT, THERE'S MORE!**

Taking a cue from Microsoft Windows, IBM has included a number of small applications, or "applettes," and games with OS/2 2.0, which are installed in the Productivity and Games folders in the main OS/2 System folder. Besides versions of Klondike Solitaire and Reversi, there is a jigsaw puzzle that uses OS/2 bitmaps, a scrambled-number game, and a version of chess for one or two players (two players can even play across a network).

The Productivity applettes cover a wide range of functions. Chief among these are a simple Terminal program similar to the Windows Terminal; Pulse, which monitors system activity with a constantly updated graph; and PM Chart, a version of Micrografx's charting program that lets the user create various charts and drawings. Also included are the Icon Editor, which lets you modify existing icons or create new ones; System Editor, which is equivalent to MS-DOS 5.0's Edit utility; Enhanced Editor, a mini word processor; Picture Viewer, which lets you view, print, and convert OS/2 bitmaps and metafiles; and File Search/Find, which lets you search for files across multiple hard disks.

The rest of the applettes consist of what used to be an internal IBM application called PM Diary that "escaped" to a number of BBSs in its OS/2 1.2 version. These applettes include a calendar, meeting planner, alarm (a pop-up that will tell you when it's time for a meeting), to-do list, calculator, and notepad. There is also a mini spreadsheet with 80 columns by 26 rows, and a small database system that is similar to the Windows Cardfile and useful for keeping limited lists such as an address book.

**A BETTER DOS THAN DOS?**

OS/2 2.0 support for DOS applications is excellent. Each DOS session can access up to 640K of conventional RAM, with almost 620K available at the DOS prompt. This can be increased to 640K by changing the DOS setting to load the DOS kernel into high memory. Support is included for the upper memory block (UMB) functions of DOS 5.0, so TSRs can be loaded into high memory in each DOS session by using the LOADHIGH function. DOS sessions can be switched between full-screen and windows on the Desktop with the Alt-Home key combination.

OS/2 2.0 ships with a number of games and productivity applications, including a communications program, charting program, system monitor, small database, and spreadsheet.

Each DOS session can theoretically access up to 32MB of EMS memory and 16MB of XMS memory. As an experiment, we changed the settings in a plain DOS window to reflect the maximums and also loaded the DOS kernel into high memory. Both the DOS MEM utility and the Mapmem utility reported 640K of conventional RAM, 11MB of EMS, and 10MB of XMS memory available—on a 20-MHz 386 with only 8MB of real memory!

This is possible because the OS/2 operating system uses virtual memory to the fullest. Swapping to disk does slow things down a bit, but the swapping algorithm in OS/2 is intelligent: It only swaps what it recognizes as data. The swapping algorithm does not bother to swap out executable code because it knows it can just reload the code from the disk where it originally came from. The algorithm is also smart enough to allocate memory on the fly; even when it says there is 10MB, it does not actually use 10MB until that amount is needed.

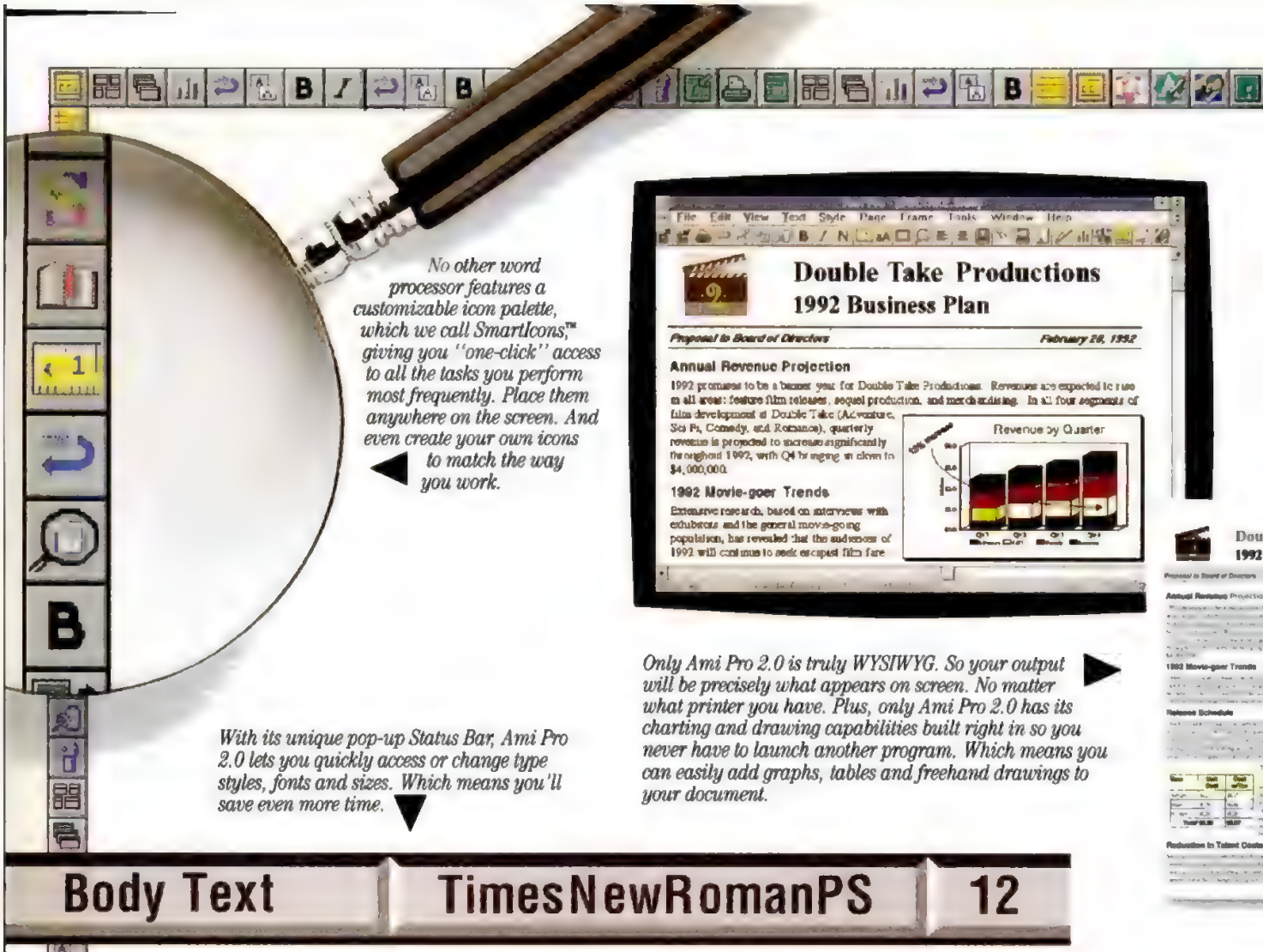
As an informal performance test, we tried using a word processor in one DOS window while running communications software in another DOS window as a background process. After tweaking the settings a bit (for example, adjusting the amount of memory assigned to each window), there was virtually no perceptible slowdown in execution speed, and switching between the two programs was quick and smooth.

Support is also provided for DPMI applications such as *Lotus 1-2-3*, Version 3.1; a configuration parameter controls the amount of DPMI memory available to the application. The only DOS applications not supported are those that use the VCPI (virtual control program interface), a method for running in DOS protected mode that preceded DPMI.

Most DOS device drivers are supported. A driver can be loaded in the individual sessions by simply entering the driver path and name in the settings screen. Or, if the driver needs to be accessed by every DOS session, it can be included in the CONFIG.SYS file.

DOS compatibility was given very high priority in OS/2 2.0 and this version comes with a DOS 5.0 emulator. But if you want to run DR DOS, if you are running a DOS program that requires a different version of DOS, if you need a device driver that

OS/2 2.0 supports multiple DOS sessions; each DOS session provides conventional RAM, LIM EMS, and XMS memory. Users can adjust the available amounts of each type of memory.

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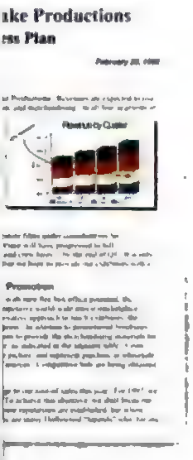

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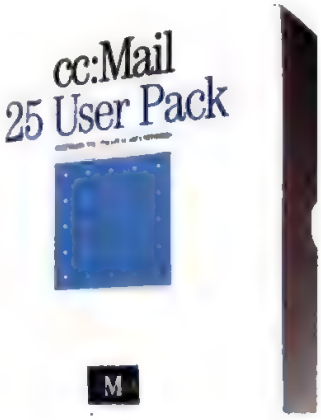


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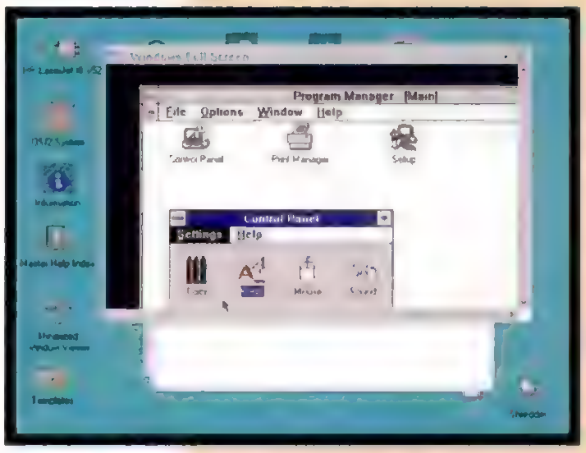
cannot run under the emulator, or if you have any other compatibility problems, you can easily boot the real thing in a DOS window. Just add the boot path to the settings screen. And you do not have to boot from a floppy disk; the path can point to an image file on your hard disk.




Windows 3.0 applications run in a full-screen session or in a window running on the OS/2 PM Desktop under OS/2 2.0. But Windows in a window is limited to VGA resolution at this time.

### A BETTER WINDOWS THAN WINDOWS?

As we went to press, OS/2's ability to run Windows applications seamlessly was close to completion. You can run multiple full-screen windows sessions, each in its own virtual machine, and you can run Windows applications, in a window on the WPS Desktop. But the version we looked at was limited to running Windows in an OS/2 window at VGA resolution. There are also extra steps involved in installing Windows applications, because they do not automatically appear on the Desktop.

Windows applications can only run in Real and Standard modes and support for Enhanced mode is not planned for the final release. This is not as significant a limitation as it sounds, since one of the biggest advantages of running Windows in 386 Enhanced mode is the ability to multitask DOS applications—an ability already present in OS/2 2.0. The other reason to support Enhanced mode, however, is to run Windows programs that use 32-bit addressing, such as *Mathematica*. Most Windows programs that use 32-bit addressing do so through WINMEM32 .DLL (as recommended by Microsoft), and OS/2 does not support WINMEM32 .DLL.

Each Windows session has a limited Program Manager, with a Control Panel and Clipboard. Windows programs are installed under OS/2 2.0 the same way they are installed normally. You open a Windows window and then use the Run command or you install it from the DOS prompt—whatever the program requires.

OS/2 2.0 also supports dynamic data exchange (DDE) and object linking and embedding (OLE) between Windows applications. In addition, every Windows session has an icon for the data interchange driver, which creates DDE links between OS/2 and Windows programs. OLE between OS/2 and Windows has been announced for a version of OS/2 due to be released later this year, although there were still some bugs in the OLE implementation in the version we looked at. The DDE support is provided through the PMDDE utility.

OS/2 2.0 is especially good at multitasking, because it protects each application's allocated memory from the other applications running. A crash in a DOS or Windows window will not cause the whole system to crash. OS/2 will shut down any application trying to access memory belonging to another application and then alert the user to a protection violation. But OS/2 itself and the applications in the other windows will continue to run without incident.

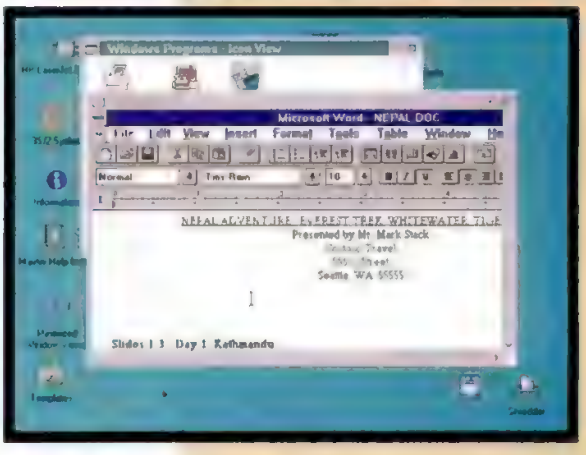
This exceptional stability is due to the fact that OS/2 is a protected-mode operating system, not a GUI running on top of a real-mode operating system such as DOS. The memory used by each application is guaranteed to be independent of the others; OS/2 prevents an application from accessing memory that the application does not own. This protection against memory-access conflicts makes OS/2 well suited for networked database applications. OS/2's relatively crash-free design also recommends it for mission-critical applications such as billing systems.

We tried to test OS/2's protection capabilities by deliberately inducing a UAE (Unrecoverable Application Error) in a Windows window. But our attempt failed completely with all of the Windows applications on the test system, including some that will crash when running under Windows 3.0. This is testimony to OS/2 2.0's stability.

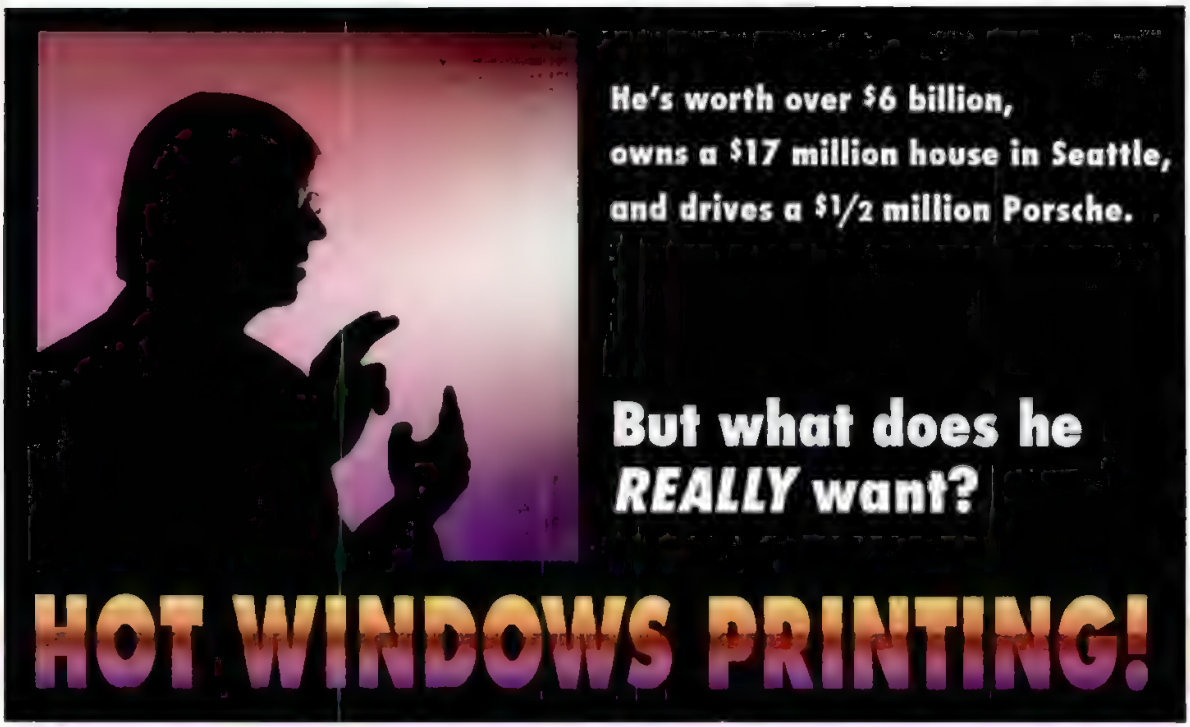
### THE LEARNING CURVE

The Workplace Shell is sufficiently different from existing PC-based GUIs that it will require some relearning. Its object-oriented approach forces the user to think about things differently. Macintosh users and those coming to a PC-based GUI for the first time may have an easier time adapting to the WPS than users already accustomed to Windows or Presentation Manager.

At first, we found the WPS very confusing, particularly in the way the mouse works. Like Windows or Presentation Manager, the WPS uses left mouse button clicks to launch applications, bring a window to the foreground on the desktop, or pull down a menu. But dragging an icon to move or shred a file is done with the right mouse button (or middle button on a three-button mouse). The right mouse button can also be clicked anywhere on an




Getting a Windows application to run on the OS/2 Desktop requires only slightly more work than in Windows. Each Windows application has a limited version of the Program Manager, including a version of the Windows Control Panel that controls the appearance of OS/2's Windows sessions.

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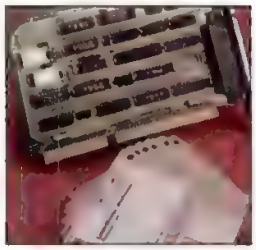

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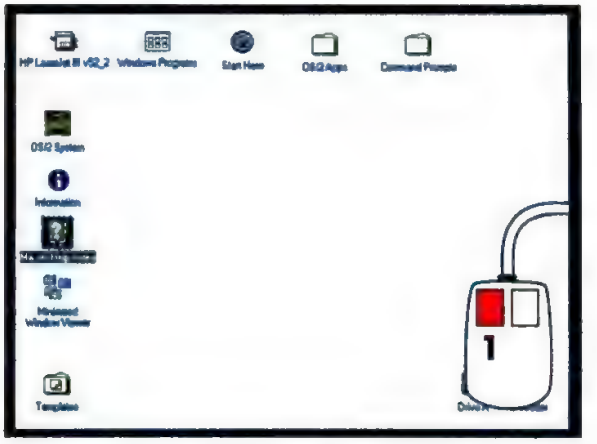
# A GUIDED TOUR OF THE WORKPLACE SHELL

**by Joe Salemi**

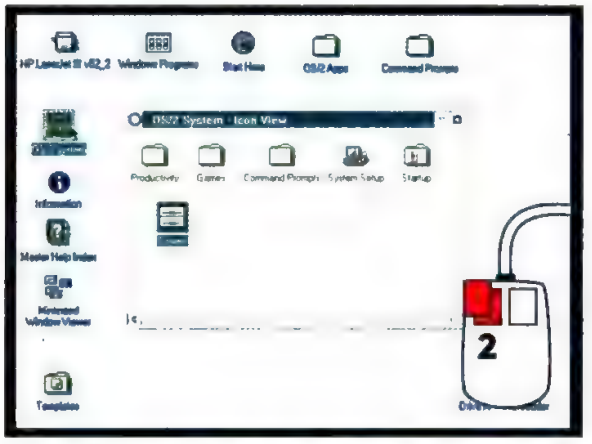
There are a number of fundamental differences between the way the Workplace Shell (WPS) in OS/2 2.0 works and the way the GUIs in OS/2 1.*x* or Windows 3.*x* work. Most important, the WPS is object-oriented. Almost everything is treated as an object, including icons, folders, applications, and files. As part of the object-oriented design, the left and right mouse buttons are used to control different functions. The right mouse button (or the center button on a three-button mouse) is used to pop up an object's System Menu, which describes its attributes. Using the right mouse button may be confusing at first if you are used to Windows or Presentation Manager.

As the saying goes, A picture is worth a thousand words. So here, in screenshots and a few words, is a tour of the WPS, paying close attention to mouse use. In the explanations that follow, *clicking the mouse button* means pressing and releasing the button once and *double-clicking* means clicking the button twice in succession.

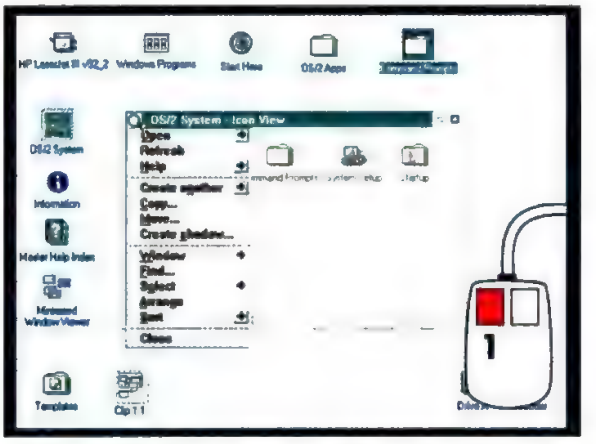
**The initial WPS display, called the Desktop, consists of a mostly blank screen with icons representing the Print Spooler, Shredder, and various folders. Users can arrange the icons in whatever pattern they prefer.**




**Clicking on an icon with the left mouse button highlights the icon for further action, as seen here with the Master Index icon near the left center of the screen.**




**Double-clicking on an icon with the left mouse button opens the object that the icon represents into a window (here, the OS/2 System folder is being opened). Note the small representation of the object's icon in the upper-left corner, where the system bar normally appears in a Presentation Manager or Windows 3.*x* window.**

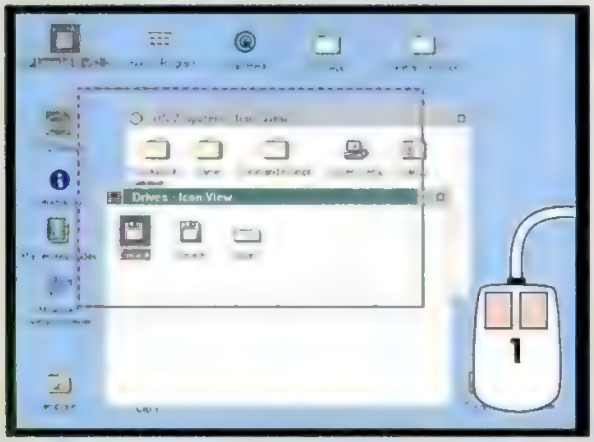



**Clicking with the left mouse button on the system icon in the upper-left corner of the window brings up the System Menu for the object in that window. The items on the menu vary according to the type of object in the window and the actions that can be taken on that object.**

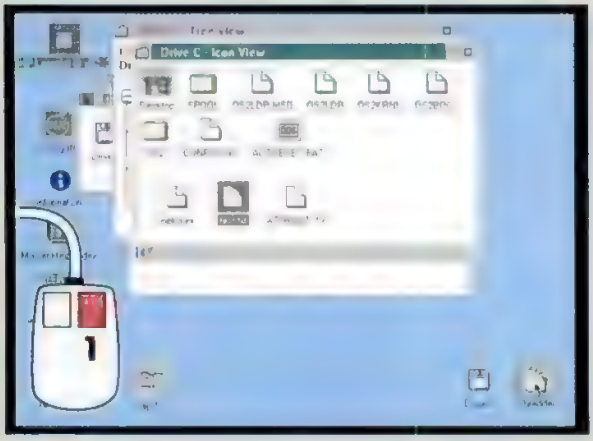
Clicking on the arrow button in the menu with the left mouse button brings up the submenu for that particular item.

Clicking anywhere in the window of an object with the right mouse button also brings up the System Menu for that object.

Clicking with the right mouse button on an object's icon brings up that object's System Menu without having to open the object.




Putting the mouse pointer on a window's title bar and holding down either mouse button lets you move the window around. Putting the pointer on any of the edges and holding down either button lets you size the window.




Putting the mouse pointer on an object's icon and holding down the right button lets you drag the object to another location. Releasing the mouse button drops the icon in the new location. For example, if the other location is in the same window, the icon is moved; if the location is another window, the icon and the object it represents are moved to that window. Here, the icon for the file Test.txt is being dragged to the Shredder icon. When the icon is dropped, the file will be deleted from the hard disk after you receive a confirmation message.

Clicking both mouse buttons together anywhere on the Desktop, including inside open windows, brings up the Windows List. This is the replacement for the OS/2 1.*x* Task Manager (equivalent to the Windows 3.*x* Task List) and lists all the currently open objects, such as folders or applications. Clicking on the name of any item in the Windows List brings that object to the foreground.

## DEBUNKING THE MYTHS OF OS/2

**Myth 1: You have to reformat your hard disk to install OS/2.** This is only true if you decide you want to use the High Performance File System (HPFS) introduced with OS/2 1.2. And with HPFS, users have always had the capability to partition only part of the hard disk as an HPFS; the rest is left as a FAT (file allocation table) and thus available from normal DOS. Versions 1.0 through 2.0 of OS/2 have supported the standard DOS file system for backward compatibility, and it has always been possible to install and use OS/2 on a preexisting FAT system without losing any files.

**Myth 2: OS/2's system requirements are excessive.** This seemed true in 1987 when OS/2 1.0 was released and required at least an 80286 with 3MB of RAM. But the changes since then have been minimal: OS/2 2.0 requires an 80386 or better system with 4MB of RAM. What seemed excessive five years ago is now considered a normal Windows 3.*x* system; current Windows users can upgrade to OS/2 without having to make any hardware upgrades.

Still excessive are OS/2's hard disk requirements: The bare minimum for OS/2 2.0 is around 15MB of disk space and loading the full system can eat up 30MB. But consider that in about 18MB of disk space you get a full 32-bit multitasking operating system, the equivalent of MS-DOS 5.0 and Windows 3.0, and complete on-line documentation for all three. In that light, the requirements, while still high, do not seem excessive after all. A 386SX with 4MB of RAM and a 60MB hard disk is an acceptable minimum system for OS/2 2.0.

**Myth 3: OS/2 is incompatible with existing DOS applications.** This is partially true under the 1.*x* versions. OS/2 1.*x* is limited to only one DOS session at a time and generally does not run any DOS applications that require device drivers loaded through CONFIG.SYS or any applications that need expanded or extended memory. OS/2 2.0 uses the memory management of the 80386 chip to bypass this issue: EMS (expanded memory specification), XMS (extended memory specification), and DPMI (DOS protected-mode interface) are completely supported for DOS applications and individual drivers can be custom-loaded into particular DOS sessions as needed. Many drivers can even be loaded through the OS/2 CONFIG.SYS, so they are available to all DOS sessions. Finally, the ability to boot different versions of DOS from either the hard disk or a floppy disk completely eliminates 99 percent of the incompatibilities that remain—only VCPI (virtual control program interface) applications are not supported.

**Myth 4: OS/2 is proprietary to IBM and IBM PS/2s.** The second part of this myth was never true, as all 1.*x* versions of OS/2 were supported on IBM's AT systems. Three factors probably caused the confusion that led to this myth. First, many users mistakenly linked OS/2 with the PS/2 system because the names are similar; this connection has not yet been erased from users' minds. Second, OS/2 can take advantage of ABIOS, the protected-mode BIOS that PS/2 uses. Many users thought this meant that OS/2 required a proprietary BIOS, but the vendor was only taking advantage of the special features existing in its systems. Third, the early versions of OS/2 required special drivers from the manufacturers of PC clones to work with many of the nonstandard system components (such as SCSI drives); IBM's version did not work out of the box on many clones.

As of January 1992, IBM committed to having OS/2 2.0 work on as many different systems as possible; the company has published a constantly updated list of systems that OS/2 2.0 has been tested on. OS/2 2.0 also works on many systems not yet tested by IBM. Of course, *working with* is different from *supported on.* By the time OS/2 2.0 is released, support should exist for just about all the major clone systems in the marketplace (but it is still not clear who will provide the support).

**Myth 5: OS/2 is always late.** This one depends on how you look at it. IBM announces its plans well in advance (perhaps too far), and IBM has never waited until the last moment to announce if it will not meet a ship date. When a date is pushed back, it happens months before the product was supposed to ship, which gives IBM's clients enough time to revise their plans. IBM has never simply missed an announced ship date, but, then again, neither has any other vendor that reserves the right to change an announced ship date. ■

icon or window to bring up the system menu for that application. Holding both buttons down at the same time brings up the Window List, which replaces the Task Manager and offers an alternative way of moving between applications. But after using the WPS for a couple of days, the whole system became more intuitive and easier to use. (The sidebar "A Guided Tour of the Workplace Shell" provides a step-by-step example of using the WPS.)

The on-line documentation is a big help in becoming familiar with the WPS. In addition, the manual includes a section on setting up the WPS to resemble the Presentation Manager interface while learning the new system (IBM says that this may be an automated option in a future release). But you probably should take the time to get a feel for how the WPS is designed to work. IBM has been criticized for introducing a new GUI approach this late in the game, but the Workplace Shell is worth learning and using.

#### WHAT'S MISSING?

Since Windows 3.1 was not yet released as of this writing, Windows 3.1 applications are not yet supported. IBM has announced that it will support them in an update to OS/2 2.0 soon after Microsoft releases Windows 3.1.

One feature that Windows 3.1 supports that is lacking in OS/2 2.0 is the Ctrl-Alt-Del trap for DOS applications. In Windows 3.1, this combination lets you either close only the offending application or

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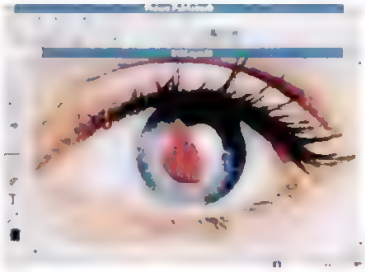

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reboot your computer. But under OS/2, pressing the reboot keys anywhere in the system, even in a DOS or Windows full-screen session, reboots your computer. This can be a problem: Data can be lost and files from background applications can be trashed when the normal OS/2 shutdown procedure is bypassed. This is partially counterbalanced by the fact that a locked-up DOS application usually does not lock up the whole system due to OS/2's native memory protection mechanism; the user can just switch back to the Desktop and close the errant application from there.

Also missing from this release is support for 32-bit Windows applications that use WINMEM32.DLL. Virtually all Windows applications that use 32-bit addressing use WINMEM32.DLL, the method provided by Microsoft; these programs only run in Enhanced mode, which OS/2 2.0 will not support.

Programs that use direct disk sector addressing, such as Norton's UnErase utility, cannot be run in an OS/2 DOS session. But OS/2 provides a mirroring capability (similar to that in DOS 5.0) that moves a deleted file to a hidden place on the disk, where it can later be recalled or purged. And there are third-party utilities that support undeleting files on HPFS partitions. This capability can be turned off if you do not want to spend the disk space needed to run it.

At this time, the full 32-bit graphics engines promised for Version 2.0 exist, but IBM is undecided about whether they will be included in the initial release.

Network support for Novell's *NetWare*, IBM's *LAN Server*, and Microsoft's *LAN Manager* was in beta testing at press time, but was not part of the version we tested. Network support should be available shortly after the final version ships.

**INSTALLING OS/2**

Normally we do not dwell on the details of software installation, but because OS/2 is a new operating system, installation is a major undertaking and the story is worth telling. As we went to press, there were still minor bugs in the installation program.

The first portion of the installation process uses a character-mode interface. The user is given a number of options, such as whether to format the hard disk and what type of mouse to attach to the system. After the core system files are installed, the PC reboots and switches to a graphical interface. At this point, the user can change any of the basic system information (type of mouse or keyboard, for example) and then choose which type of system to install: minimum, full, or user-selected.

The user-selected installation option is the most flexible choice, letting you choose which features to install and which to leave out. A counter in the lower right-hand corner of the screen keeps a running tally of available disk space and the amount of disk space needed by the chosen options. Note that disk space must also be kept free for the virtual memory swap file, which can range from 1MB to 12MB in size, depending on system memory and the number of applications open. Swap file space requirements are not reflected in the counter of needed disk space. It is important to keep an eye on the counter.

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The installation program will not prevent you from trying to install more than you have room for; it will merrily continue installing the options until the process crashes. Depending on where it crashes, the system could be rendered inoperative and you would have to start the whole thing again after booting with an emergency disk. You can use one of the first two installation disks for this purpose, using the Esc key to drop out of the installation process into a character mode of OS/2 so you can delete files from the disk.

If you do not have enough disk space to install everything you want, you can install just the basic operating system to get up and running. Later on, you can delete files to make space on the disk and then run the selective install program to install the options you want.

If a version of DOS 3.*x* or later is found on the disk during the installation process, OS/2 2.0's dual-boot support is automatically activated. This is identical to the one provided in OS/2 1.3, where the BOOT program is run with the "/DOS" or "/OS2" command line option to swap the appropriate files around and reboot the system into the other operating system. In order for dual-boot to work, the primary (C:) partition has to be in the traditional DOS file allocation table (FAT) format so DOS can see and boot from it.

**FACT FILE**

**OS/2, Version 2.0**
IBM Corp., Old Orchard Rd., Armonk, NY 10504; 800-342-6672, 800-426-2468
**List Price:** $195. Upgrade from previous versions: free until July 31, 1992; subsequently, $149.
**Requires:** 386SX-based PC or better, 4MB RAM, 60MB hard disk, EGA monitor. 6MB RAM and VGA monitor or better recommended.
**In Short:** This is the OS/2 everyone has been waiting for. Version 2.0's support for 32-bit applications, multiple DOS and Windows sessions, and native protected-mode multitasking make it a powerful and attractive PC-based operating system. Its system requirements are correspondingly heavy.

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OS/2 2.0 also provides another multiple-boot option, the Boot Manager, which lets you run multiple operating systems in separate partitions on your hard disk. You can have DOS, OS/2, and AIX (IBM's version of Unix) all installed on your hard disk and choose which operating system to run when the system is rebooted. The Boot Manager itself lives in a 1MB partition on the primary boot disk; the requirements for the other partitions vary according to the size of the operating system being installed. On the positive side, you can use the Boot Manager to run DOS 3.3, DOS 5.0, OS/2 1.3, and OS/2 2.0 on the same system, for example. On the negative side, other operating systems' primary partitions are invisible to the active one, which restricts what you can move from one to the other. The Boot Manager also requires that you reformat your hard disk, so you would have to back up all your existing data before installing it.

At the end of the installation process, a list of printer drivers is presented and one or more drivers can be installed. The number of supported printers was a prob-

# HOW TO GET IT.

Every program in the "PC/Computing Guide to Shareware" is available through ZiffNet, the on-line service all about computing. You can easily download programs from a fully indexed software library.* ZiffNet also plugs you into information on what to buy, delivers industry news even before it's in print, and offers forums hosted by the editors of *PC Magazine* and *PC/Computing* to ask for advice or discuss issues. **Call 1-800-666-0330.** And remember, if you want to get into shareware, you need just two things. This guide. And ZiffNet.

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lem in older versions of OS/2, though it increased with each release. In OS/2 2.0, there are over 200 printer drivers, supporting almost every major laser and dot matrix printer. Finally, the user is given the option to migrate DOS and Windows applications. If you choose to do this, the installation program will search your hard disk for existing applications and add them to either a DOS or a Windows folder on the desktop.

One of the most important choices you will face is whether to dedicate part or all of your hard disk to the HPFS. The performance and storage advantages of the HPFS over the FAT system have been well documented (see the Power Programming column in the April 10, 1990, issue of *PC Magazine*). The directory structure of the HPFS is faster and better organized. With the HPFS, sectors are used to store files instead of clusters, so storage is more efficient. And HPFS filenames can be up to 255 characters long.

***In OS/2 2.0, there are over 200 printer drivers, supporting almost every major laser and dot matrix printer.***

HPFS disks cannot be seen or used when DOS is the primary operating system, however. And DOS sessions under OS/2 are limited to seeing only the files whose names are in the FAT-style eight-plus-three-character format, whether FAT or HPFS is used. Also, you cannot use the dual-boot function if the primary partition is HPFS, as DOS cannot boot from it. So you must choose between performance and compatibility. A good compromise is to install OS/2 in a root directory FAT partition big enough for running all your DOS applications and then format the remaining space as HPFS. You can then move many of the OS/2 system files and the swap file to the HPFS partition to take advantage of its increased performance.

## WINDOWS NT: The Next Big Step For Windows

**by Charles Petzold**

The most puzzling question raised by Windows NT is, Why do we need yet another operating system when things are confused enough as they are?

Well, when the idea for NT was born, the landscape was very different.

Windows NT (for *new technology*) is the current name for the new portable 32-bit operating system from Microsoft. For its primary application environment, Windows NT will feature an enhanced 32-bit version of Windows. Like Unix, Windows NT has been designed to be portable; the first versions will run on 80386 and 80486 machines and DEC workstations based on the MIPS R3000 and R4000 chips. Beta versions of Windows NT have gone in limited distribution to developers and Microsoft is predicting the retail release by the end of 1992.

### SHIFTING FOCUS

The Windows NT project began at Microsoft about three years ago under the direction of Dave Cutler, a key designer of VMS (Virtual Memory System) at Digital Equipment Corp. Windows NT was originally intended to be OS/2 3.0: a 32-bit version of OS/2 that could be ported fairly easily to other microprocessors, particularly RISC machines and multiprocessor boxes. This involved redesigning the kernel and writing it in C rather than assembly language, as well as porting the OS/2 Presentation Manager to a 32-bit environment.

Around the fall of 1990, the Windows NT project changed direction. OS/2 sales were going nowhere and Windows 3.0 sales were going through the roof. IBM and Microsoft split company; IBM took over OS/2 2.0 but left OS/2 3.0 in Microsoft's hands. Soon after, Microsoft abandoned Presentation Manager and decided to put a 32-bit version of Windows into Windows NT instead. What had been called at various times "OS/2 3.0" and "NT-OS/2" then became known as "Windows NT."

As it stands now, Windows NT will feature a full 32-bit kernel that can handle multiple processors and preemptive multitasking. Unlike the cooperative nonpreemptive multitasking found in Windows today, Windows NT will not allow one program to hold up the system. Although the primary application environment will be a 32-bit version of Windows, Windows NT will also run existing 16-bit Windows programs and DOS programs. Windows NT is designed to conform to the POSIX standard (a form of Unix often required for government contracts) and meet government security ratings. Some OS/2 compatibility may also be in Windows NT, although the extent of this seems to change with the winds.

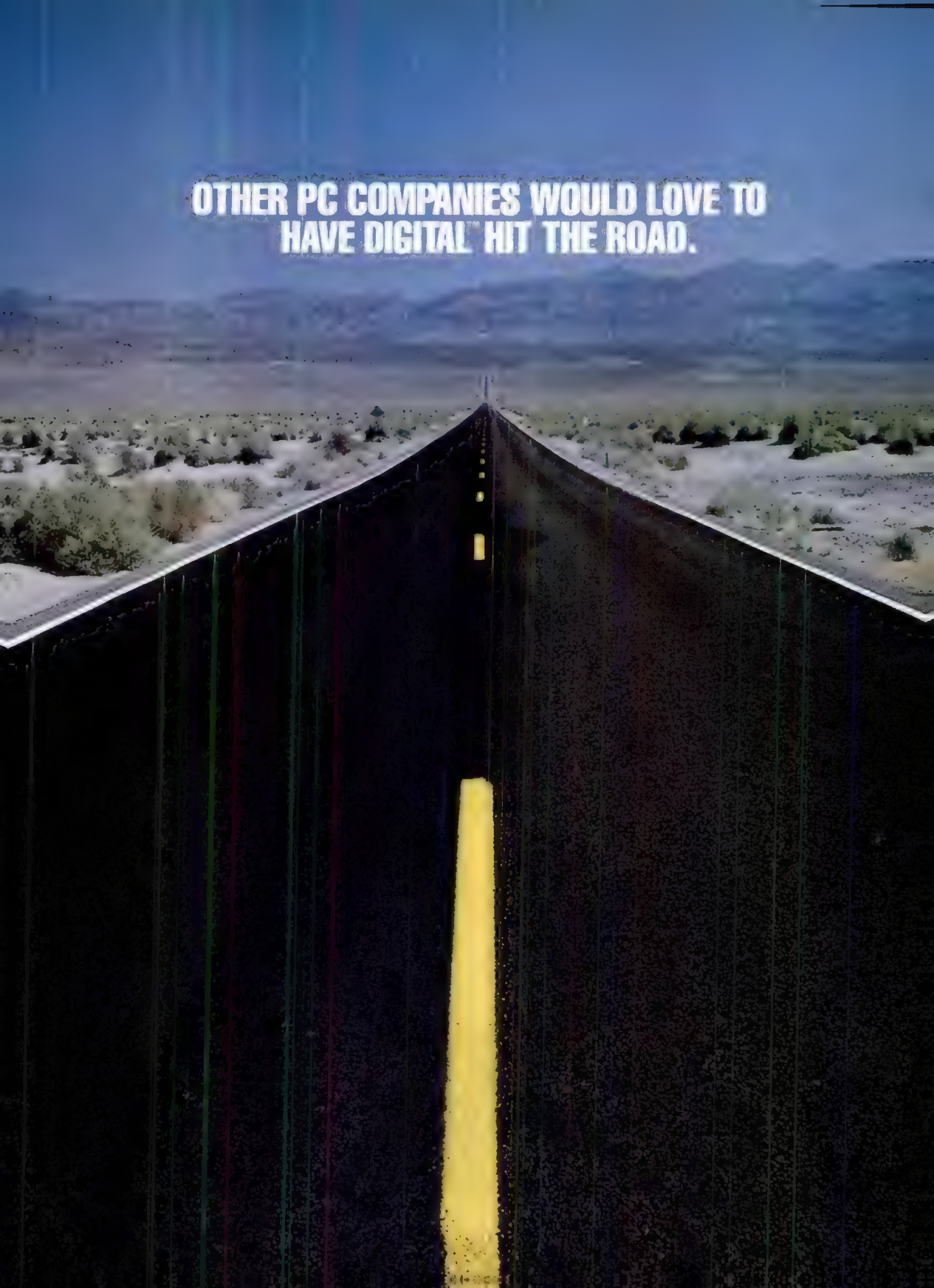
### THE WIN32 API

Windows NT is the first implementation of what Microsoft dubs *Win32*. Win32 is not a product itself but a specification for an application programming interface (API). Win32 is a lot like Win16 (the current Windows API) but expanded to 32 bits with some enhancements.

The most notable enhancement is full preemptive multitasking and multithreading. As with OS/2 programs, Windows NT programs can split themselves into several threads of execution that run simultaneously. Win32 also redefines the internal Windows keyboard and mouse input model to be asynchronous among applications. This means that a Windows NT program can receive keyboard and mouse input while another program is still processing earlier user input. No Windows NT program can hang the rest of the system.

The Windows Graphics Device Interface (GDI) is also being significantly improved. Many of the graphics features that made the OS/2 Graphics Programming Interface (GPI) so wonderful—including the graphics rotation made possible by matrix trans-

CONTINUES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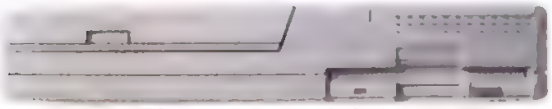

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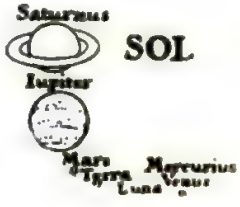


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Your base system is a: ☐ 286 ☐ 386 ☐ 486 ☐ Other

How many applications will your PC(s) run in a typical workday? _____

What best describes the type of work the system will be used for?
(Check all that apply)

| | | |
|---|---|---|
| ☐ Word Processing | ☐ Desktop Publishing | ☐ Scientific Research |
| ☐ Order-entry | ☐ Education | ☐ Software Development |
| ☐ Database (filing records) | ☐ Design (CAD/CAM) | ☐ E-Mail |
| ☐ Financial Calculations | ☐ Engineering | ☐ Other industry-specific applications (please specify) |
| ☐ Retail Store Management | ☐ Industrial Process Control | |

How many people work in your group, department or small business?
☐ Less than 10 ☐ 10-20 ☐ 20-35 ☐ More

Is your operating system
☐ DOS ☐ DOS with Windows ☐ OS/2 ☐ MAC ☐ UNIX™ ☐ Other

Which of the following graphics-oriented applications best describes your needs?
(Check all that apply)

| | | |
|---|---|---|
| ☐ Desktop Publishing | ☐ Realtime Modeling | ☐ AutoCad |
| ☐ CAD/CAM | ☐ Animation | ☐ Business Graphics |
| | ☐ Image Processing | |

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How many PCs do you have installed? _____ From how many manufacturers? _____

What kinds of connections does your PC(s) require? (Check all that apply)

- ☐ Links with other PCs in the immediate surroundings
- ☐ Connection to the local area network (LAN) throughout a building
- ☐ A line to a host system in a remote location

What kind of media (cable) is used in your LANs today? _____

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#### IS IT SOLID?

OS/2 2.0 has gone through what may be IBM's most extensive public beta test ever. In addition to IBM's internal testing, early releases of the OS/2 2.0 beta version have been available to members of IBM's DAP (Developer's Assistance Program), as well as selected corporate customers in the EEP (Early Experience Program). In addition, IBM made beta copies available to anyone willing to call its NSC (National Support Center) BBS in Atlanta and pay between $60 and $80 for the cost of duplicating and shipping the disks and preliminary manuals. IBM has received on-line feedback from users of both OS/2 1.*x* and the OS/2 2.0 beta version through the NSC BBS and the IBMOS2 Forum on CompuServe. IBM's own compatibility lab has been testing and debugging compatible systems in cooperation with other PC vendors, and as we went to press, there were 94 systems from 20 vendors certified as compatible. This broad-based testing has provided IBM with a great deal of experience in the problems of running Version 2.0 on a wide variety of non-IBM systems, and should result in a relatively bug-free final version.

But no matter how solid a product OS/2 2.0 turns out to be, IBM must still provide technical support. Traditionally, IBM has asked users to get support from their dealers or, for large companies, from their System Engineers. IBM still has not announced how it will handle technical support for users with non-IBM systems or businesses and users who are not big enough to have their own IBM representatives. Nor does IBM have a good mechanism for distributing future bug fixes (Corrective Service Diskettes or CSDs in IBM parlance); this could present an enormous problem for those who need them. Currently, CSDs are distributed through IBM's dealers and field representatives and can be downloaded from IBM's BBS or CompuServe. But the CSDs generally consist of five or more disks, and not many users will want to spend the time or money to download files that large.

#### IS OS/2 2.0 FOR YOU?

People's first worry when thinking about using a new operating system is whether there are programs that run on it. Due to the care IBM has put into ensuring that DOS, Windows, and OS/2 1.*x* applica-

## WINDOWS NT: The Next Big Step For Windows (CONTINUED)

forms, the complex curves made possible by Bezier splines, and useful tricks with lines and areas made possible with PostScript-type paths—are all part of Win32, as well as support for halftones and device-independent color. These enhancements bring the Win32 GDI nearly up to the graphical standards established by GPI.

At some point, the Win32 API will also find its way into a DOS-based version of Windows, but this is not expected until 1993. This DOS-based version of Windows will require an 80386 or 80486 and will feature the entire Win32 API (including multithreading) with the exception of some government security requirements.

The ability to continue to run a Win32 version of Windows on top of DOS is good news for DOS and Windows users who are not yet ready to make the leap to a new operating system. The good news for developers is that Windows NT executables are intended to run without modification under this DOS version of Windows.

#### MAKING THE BIG SWITCH

Windows NT illustrates the lessons Microsoft has learned from the problems with OS/2. While it is occasionally reasonable to ask programmers to make big leaps—such as the leap from DOS character-mode programming to Windows graphical programming—you cannot come back a couple years later and ask them to migrate their Windows code to the significantly different OS/2 Presentation Manager.

Many software vendors and corporate programmers had to choose between developing for Windows and developing for Presentation Manager. The larger installed base for Windows made the choice obvious, resulting in few available Presentation Manager applications (and, therefore, fewer reasons for users to buy it).

Clean breaks are great in theory, but this industry has become so large that it often moves slowly and cautiously. What we now value are continuity, consistency, and compatibility. Developers have invested much time and energy in creating Windows applications. To preserve this investment, Windows must have a clear future growth path, and that (in part) is Windows NT.

Unlike the OS/2 Presentation Manager, Win32 is a straightforward extension of the current Windows API. Although translating a 16-bit Windows program to a 32-bit Windows program will not be quite as easy as translating a 16-bit Presentation Manager program to a 32-bit Presentation Manager program, it will be much easier than converting a 16-bit Windows program into a 16-bit or 32-bit Presentation Manager program.

And because Windows NT features Windows as its application environment, getting Windows NT to run existing 16-bit Windows programs should also be easier, cleaner, more compatible, and more efficient at getting Presentation Manager to run them.

#### WILL WINDOWS NT FLY?

As two graphics-based 32-bit operating systems, Windows NT and OS/2 2.0 stand face-to-face in the market. On the one hand, Windows NT will have to catch up with OS/2's maturity and its growing (but belated) acceptance among users. On the other hand, the support of a 32-bit Windows API in Windows NT should give developers much less grief than Presentation Manager and thus prompt the early availability of Windows NT applications.

Because of its portability to non-Intel architectures, Windows NT could also be a formidable competitor to Unix. The Windows NT and Unix sideshow may prove very interesting.

The most intriguing question of all may be whether Windows NT or anything else can dislodge DOS from its long-standing reign on the desktop. ■

## 32-BIT GUI ALTERNATIVES: No Contest

**by William F. Zachmann**

IBM's OS/2 2.0 and Microsoft's Windows NT get the lion's share of attention when the topic is 32-bit GUI (graphical user interface) operating systems for Intel architecture. But Unix was well ahead of both of these in the race to bring 32-bit GUI capabilities to Intel-based systems.

Both Interactive Systems and Santa Cruz Operation (SCO) began shipping 386-specific versions of Unix in 1987: the 386/ix and the Xenix 386, respectively. Before long, both companies moved to more standard offerings based on Unix International's Unix System V specification (previously AT&T's SVID specification). Other vendors have subsequently entered the fray.

Prior to 1990, however, the total number of 32-bit Unix installations on Intel-architecture systems was small. Most of these were used strictly in character mode. Despite the inclusion of basic GUI capabilities conforming to the X Window protocol, these early 32-bit Unix versions for IBM PC–compatible systems did not offer a practical GUI environment for more than a handful of users.

In 1989, that began to change with the introduction of SCO's Unix System V/386 and its Open Desktop graphical operating system environment. Open Desktop was the first 32-bit Unix GUI for Intel architecture that was packaged in a form accessible to ordinary users and that carried a realistic promise of available shrink-wrap software.

Based on Unix System V, Version 3.2, Open Desktop includes a complete GUI, networking services, and the ability to run many though not all DOS applications. Since Open Desktop will run Windows only in Real mode, it is not a practical environment for Windows.

Open Desktop's system requirements are heavy. It requires an ISA, EISA, or MCA system with at least an 80386 and 8MB of memory. The operating system itself requires 100MB of disk space; in practice, each user will need at least a 200MB hard disk.

The GUI is built on the X Window system and uses the OSF/Motif Window Manager and Desktop Manager. OSF/Motif is very similar to Windows in behavior, but has the three-dimensional look of the OS/2 2.0 Workplace Shell. OSF/Motif is priced at $1,295 for one to two users, and currently there are not many popular PC apps on the platform.

The primary rival to SCO's Open Desktop is likely to be SunSoft's Solaris 2.0, which is scheduled to ship in the third quarter of 1992. SunSoft, a subsidiary of Sun Microsystems, recently acquired Interactive Systems' Unix business for Intel architecture systems. SunSoft also brings Sun's workstation version of Unix for the RISC-based SPARC (Scalable Processor Architecture) processor to the Intel desktop as well. Updated to Unix System V, Version 4, Solaris 2.0 will have the advantages of both the broad base of applications already developed for Sun workstations and the implementation of Unix System V, Version 4, at its foundation. Resource requirements for the Solaris will probably be similar to or slightly greater than those for SCO's Open Desktop.

Another Unix-related contender is the NeXTstep 486, from NeXT. Built on the Macintosh operating system kernel, the object-oriented NeXTstep is an Intel architecture version of the much praised (if little bought) operating system developed for Steve Job's NeXT computers. NeXTstep will require an 80486 with 8MB to 16MB of RAM. The user version will occupy 120MB of disk space; the developer version will need a whopping 400MB.

What are the prospects for these and other Unix-related 32-bit GUI operating systems on the Intel desktop? Probably no more than modest success. All require system resources well beyond what OS/2 2.0 does. They even make Windows NT look like a comparative lightweight in that regard. None offers more than limited backward compatibility for DOS and Windows software. All cost more than OS/2 2.0, and Windows NT is likely to be priced well below them, as well. NeXTstep, for example, costs $995; OS/2 costs $195.

SCO's Open Desktop, SunSoft's Solaris 2.0, and NeXT's NeXTstep 486 will have some success, particularly in shops where Unix is already used in one form or another. They will probably enjoy success in vertical markets with custom applications; in fact, OS/2 2.0 will have to compete strongly with them for this market. But between the system resource demands and the lack of mainstream applications, these 32-bit contenders have a way to go before they provide any serious competition. ■

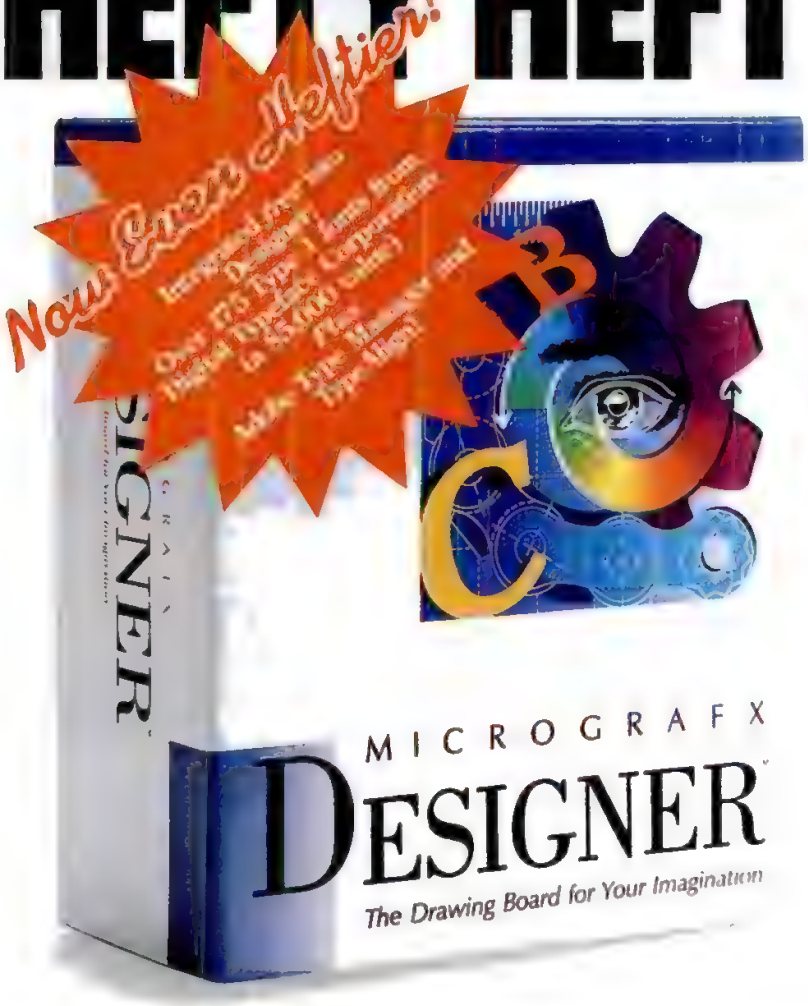
tions will run under OS/2 2.0, this is much less of an issue than it was in the past. Still, since OS/2 2.0 has not even been released as of this writing, there are not yet any applications that take full advantage of the operating system's power. But there should be some soon. Borland International recently announced a C++ compiler for OS/2 and a number of other vendors have committed to porting their applications over to OS/2 2.0.

OS/2 2.0 with the Workplace Shell is designed to be a high-powered operating system with an innovative, object-oriented GUI. IBM promises that this will be the OS/2 we have been waiting for, solving all the problems of OS/2 1.*x* and adding more features. IBM is down to the wire in smoothing out the rough edges of this ambitious operating system. What remains to be seen is whether IBM can effectively market the product, especially in the light of the Windows 3.1 announcement. Still, any users who want to take full advantage of the inherent power in their 80386 and 80486 systems will want to try out OS/2 2.0.

---

*Charles Petzold is a contributing editor to* PC Magazine, *and the author of* Programming Windows *(Microsoft Press). Joe Salemi is the author of the Advisor column, and a contributing editor to* PC Magazine. *William F. Zachmann is a columnist and a contributing editor to* PC Magazine. ■

# HEFTY HEFTY HEFTY

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| Type 1 fonts | 180 | 0 |
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# Windows Tips to Treasure


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ILLUSTRATION: COCO MASUDA

by Ted Stevenson

Windows is a lot like life: Just about the time you think you've got it under control, it changes, and there's always something new to know. The good news is that learning about Windows—like learning about life—can be fun.

To help you along your personal road to Windows mastery, *PC Magazine* talked to experts from coast to coast, gathering more than 40 practical tips to help you install, optimize, customize, manage, and troubleshoot Windows. Many of our tips deal with what's new about Version 3.1, but plenty apply to Windows 3.0 as well. And while some of the information can be found tucked away in obscure corners of the Windows user manuals, most is undocumented; you won't find it anywhere else.

*Setting Up Windows 3.1* guides you to

the installation that's just right for you and your system—and shows you how to preserve your carefully tuned Windows 3.0 configuration if you're upgrading. Under *Streamlining Windows*, you'll find secrets on getting the not-too-fleet-footed Windows environment to run a little more quickly and smoothly so you can finish your work sooner—and have more time to play Minesweeper. *Customizing Windows* offers advice on setting up Windows and Windows apps to think and work the way you'd like them to. We even shed new light on the darker side of Windows usage with hints on keeping the dreaded UAEs (Unrecoverable Application Errors) at bay and other Troubleshooting insights.

Whether you're an outright newcomer, a recent convert, or a longtime disciple, you're sure to find information here that will make your life with Windows more pleasant and more productive.

*Within this section you'll find secrets on how to get Windows to run more quickly and smoothly so you can finish your work sooner.*

## *Setting Up Windows 3.1*

### 1. SPEED INSTALLATION WITH EXPRESS SETUP

You have two options when you install Windows 3.1: Express or Custom Setup. Custom Setup is similar to installing Windows 3.0: You make decisions about what gets installed and where. Express Setup, new for 3.1, is the faster method and requires the least amount of input from you.

If you are upgrading from 3.0, Express Setup will search your hard disk for the Windows subdirectory and install 3.1 there. If not, it assumes you'll want it in C:\WINDOWS. All you do is fill in your name and feed the appropriate floppy disks. Express installs Windows automatically, updates your printer driver, and preserves whatever groups and applications you had in Version 3.0.

New versions of HIMEM.SYS, SMARTDRV.EXE, RAMDRIVE.SYS, and EMM386.EXE come with 3.1 and are placed in the Windows subdirectory. Express Setup rewrites your AUTOEXEC.BAT and CONFIG.SYS files to point to these files. Custom Setup, of course, allows you to edit AUTOEXEC .BAT and CONFIG.SYS, but don't forget to do it if you choose this option—Windows 3.1 will not run otherwise!

The other major difference between Express and Custom Setups relates to the swap file. If you have 2MB or more of RAM and a 386 or better, either Setup will create a swap file on your hard disk that functions as virtual memory when Windows is running in Enhanced mode.

Express Setup creates a *temporary* swap file, unless you are upgrading and already have a permanent swap file. Custom Setup creates a *permanent* swap file. A permanent swap file is almost always faster than the temporary kind and is therefore usually preferable.

—*Christopher Barr*

### 2. KEEPING YOUR 3.0 PROGRAM GROUPS INTACT

If you have a successfully operating Windows 3.0 installation that you wish to preserve but want to install Windows 3.1 fresh in a different directory, how can you quickly replicate your existing 3.0 Program Manager program groups in the new 3.1 installation?

Microsoft recommends backing up your Windows 3.0 files, upgrading to 3.1, and then reinstalling the applications. This is certainly a safe plan, because it ensures that your WIN.INI file is updated and the correct .DLLs are installed.

A shortcut involves copying your existing group (.GRP) files and editing your new PROGMAN.INI file.

First, make a backup of your 3.0 PROGMAN.INI and .GRP files. After installing 3.1, study the contents of your 3.0 and 3.1 PROGMAN.INI files. Since I installed 3.0 in C:\WIN30, the first three entries of my 3.0 PROGMAN.INI file's [Groups] section look like this:

```
[Groups]
Group1=C:\WIN30\MAIN.GRP
Group2=C:\WIN30\ACCESSOR.GRP
Group3=C:\WIN30\GAMES.GRP
```

Yours should be similar in format, with a separate line for each group. Note that the name on the left side of each equal sign contains a unique sequential number for each group. Contrast the 3.0 PROGMAN.INI [Groups] section to the 3.1 one, which for me looked like this after I installed 3.1 in a new C:\WIN31 directory:

```
[Groups]
Group1=C:\WIN31\MAIN.GRP
Order= 2 3 4 1
Group2=C:\WIN31\ACCESSOR.GRP
Group3=C:\WIN31\GAMES.GRP
Group4=C:\WIN31\STARTUP.GRP
```

You should note that these four.GRP files exist in your main Windows 3.1 directory (C:\WIN31 here). Back up these four .GRP files. Then copy all of the old 3.0 .GRP files, *except* for the ones with the same names as the 3.1 groups, into your main Windows 3.1 directory. If you also want to preserve your original groups that have the same names as the basic 3.1 groups, simply copy these 3.0 .GRP files while giving them new names (such as MAIN30.GRP, ACCESS30.GRP and GAMES30.GRP):

```
copy   C:\WIN30\MAIN.GRP   C:\WIN31\
MAIN30.GRP
copy C:\WIN30\ACCESSOR.GRP C:\WIN31\
ACCESS30.GRP
copy   C:\WIN30\GAMES.GRP   C:\WIN31\
GAMES30.GRP
```

(You shouldn't have a 3.0 STARTUP .GRP, because it's new to 3.1.)

Next, edit PROGMAN.INI, adding references to the 3.0 .GRP files that you have copied to the 3.1 directory. Don't forget: Each line must begin with a group number. Once you know the total number of groups, add 5, 6, 7, and so forth, up to the total number of groups you have, to the PROGMAN.INI [Groups] Order line. The Order line changes each time you save your Program Manager settings, so the initial order does not make a difference.

For example, if you have copied and added groups A, B, and C, your new 3.1 PROGMAN.INI [Groups] section should look like this:

```
[Groups]
Group1=C:\WIN31\MAIN.GRP
Order= 2 3 4 1 5 6 7
Group2=C:\WIN31\ACCESSOR.GRP
Group3=C:\WIN31\GAMES.GRP
Group4=C:\WIN31\STARTUP.GRP
Group5=C:\WIN31\A.GRP
Group6=C:\WIN31\B.GRP
Group7=C:\WIN31\C.GRP
```

If you decided to preserve original 3.0 groups that have the same name as new 3.1 groups, the [Groups] section might then look like this:

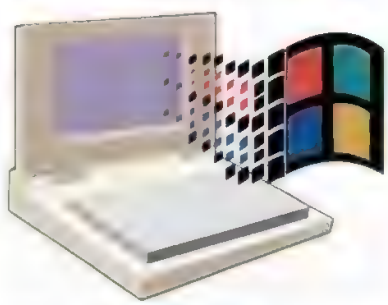
```
[Groups]
Group1=C:\WIN31\MAIN.GRP
Order= 2 3 4 1 5 6 7 8 9 10
Group2=C:\WIN31\ACCESSOR.GRP
Group3=C:\WIN31\GAMES.GRP
Group4=C:\WIN31\STARTUP.GRP
Group5=C:\WIN31\A.GRP
Group6=C:\WIN31\B.GRP
Group7=C:\WIN31\C.GRP
Group8=C:\WIN31\MAIN30.GRP
Group9=C:\WIN31\ACCESS30.GRP
Group10=C:\WIN31\GAMES30.GRP
```

*—Fran Finnegan*

### 3. LEAN, MEAN LAPTOP INSTALLATION

When you install Windows on a laptop, you'll want to eliminate unneeded files, choose a laptop-specific display option, and customize your mouse. A routine Windows 3.1 installation requires nearly 11MB of hard disk space, but you can cut that almost in half by specifying to Windows which accessories to install and which to leave off your system.

When you run Setup, choose Custom Setup. (The default, Express Setup, will give you an overstuffed disk.) Then, deselect (elect not to install) all the Windows Components check boxes: the README files (at least 360K), Accessories (1.7MB), Games (240K), Screen savers (60K), and Wallpapers (scenic backgrounds, 342K). But do choose Select Files for each of the Windows Components to install the files you can't live without individually. Among Accessories, you may want to keep Calculator (42K) and Clock (16K). Most accessories have help files (with .HLP extensions); you don't need the help file to run the accessory. You may not need accessories that duplicate apps that you use. If you have another communications program, for example, you can jettison Windows Terminal (148K) and the Terminal help file (47K).



You'll need Windows Write to view the README files (the Notepad is no longer large enough to handle the ever-expanding Windows README files); you can use most any word processor, but you'll see some garbage at the top and bottom of the file from the Windows Write format codes.

If there are Accessories files you think you might need and you're about to head out on the road, put them in a directory that does not already exist on your path. If you don't find a need for them after a month, delete them. Alternatively, carry the six Windows disks around for the first month, just in case.

Initially accept the suggested default VGA screen driver. Once you've finished Setup, load Windows, choose Main, Control Panel, then Colors. Under Colors, you have four portables options: LCD Default, LCD Reversed Dark, LCD Reversed Light, and Plasma Power Saver. Choose one of these rather than color or monochrome VGA. Reverse LCD (a feature added at the request of *PC Magazine*) works this way: Windows normally reverses your screen shades, so if you run dark characters on a white background for DOS applications, you get white on black under Windows. Reverse LCD reverses the reversal, so you get black on white. Note that black on white may be harder on laptop displays, which have a long but still finite life.

Your laptop probably emulates a 101-key Enhanced keyboard. Choose that, not the 83/84-key AT keyboard, even though it has about 80 keys.

If you travel a lot and use different printers on the road, we recommend installing three drivers: the generic TTY (teletype), HP LaserJet II, and Epson FX or MX series dot matrix printer driver. All printers (except PostScript) understand generic teletype, and virtually all laser and dot matrix printers understand LaserJet II and Epson control codes, respectively.

Install SMARTDRV.SYS, Microsoft's disk cache, and give it as much RAM as you can afford. We'd suggest 512K with a 2MB system, 1MB with a 4MB system, 2MB if you have more than 4MB. The bigger the cache, the less likely you are to wake up the disk when it's spun down. You'll also be asked to create a swap file that uses the hard disk temporarily as extra RAM. Swapfile will ask for several megabytes. If you can spare it, allow up to 4MB. (Just so you know, 4MB is unavailable, even when you're not running Windows.)

Drivers for popular mice and pointing devices are included on the Windows disks. If you have a non-Microsoft mouse and it's not listed, odds are it can use the Microsoft Mouse–IBM PS/2 Mouse driver. If you have a Microsoft-brand mouse or BallPoint, there's a better driver available, Version 8.1, that allows for an adjustable cursor size. It's not included with Windows 3.1 because Microsoft didn't want to help out the competition. It's free if you have Mouse/BallPoint driver, Version 8.0, $25 if you own an older mouse and driver. (For details: 800-426-9400 or 206-882-8080.) If you've already installed the Version 8.1 driver, Microsoft says Windows will not overwrite 8.1 with the simpler Windows driver. Contrary to some rumors, the driver is not available on BBSs or CompuServe.

*—Bill Howard*

### 4. ENSURE THAT YOUR DRIVERS ARE CURRENT

Here's a quick check to tell which of your drivers are from a previous Windows installation. After installing Windows 3.1, check the dates on .DRV files in the WINDOWS\SYSTEM directories to spot those bearing dates from Windows 3.0 (or earlier). To inspect your files from within Windows, use the File Manager. Set "Sort by" to "Last Modification Date" and then select File Details from File Manager's View menu. Use our compatibility guide ("Gain with No Pain?") in this issue to call the vendor and obtain the most current driver.

*(See Tip 5 for instructions on use of the EXPAND.EXE utility.)*

*—Lenny Bailes*

#### 5. USE EXPAND TO FETCH UNINSTALLED FILES

Under some circumstances, you may need to retrieve a compressed file from your Windows 3.1 floppy disks that was not installed on your system (or was not correctly installed) during setup. In such cases, you may use the EXPAND utility (that Setup copies to your WINDOWS subdirectory during installation) to access files such as device drivers.

First, locate the file you wish to retrieve on your Windows floppy. (Compressed files usually appear with an understrike, as in LMOUSE.CO_.)

To use the EXPAND utility, type the following command from your WINDOWS directory:

```
Expand a:\lmouse.co_ lmouse.com
(in the case of a Logitech serial mouse
driver)
```

Though EXPAND may come in handy in certain situations, regularly installing files from your Windows disks should generally be done through Windows Setup. Setup automatically edits your WIN.INI and SYSTEM.INI files to record any file pointers that may be necessary. When you expand a file manually, you have to do this yourself and risk making errors that could affect your system's performance.—*Brad Grimes*

#### 6. EASY NETWORK UPGRADES

If you're a LAN administrator with the daunting task of upgrading many network users at 30 minutes a pop, don't worry, be happy. Microsoft included a batch installation method for you.

First, change to the network drive that will act as the shared directory. Place the first Windows 3.1 installation disk in a local drive and change to that drive. At the DOS prompt, type SETUP /A (A for Administrator) and all 400-plus files will be placed on the network and expanded.

Then you have three options:

1. Typing SETUP at the DOS prompt will let you install Windows 3.1 to the local drive as if it's not connected to a network.

2. SETUP /N (N for Network) will install it as a shared copy with a minimum number of files copied to the workstation.

3. SETUP /H (H for Hands-off) is the ultimate administrator tool that uses a template file to install Windows 3.1. The template file holds the information that will be used by the workstation. As administrator, you fill in directory information and specify printers, and you have the opportunity to limit which files get loaded and which do not. For more complete information, see the Microsoft Windows 3.1 System Administrator's Guide found in the Microsoft Windows 3.1 Resource Kit.—*Christopher Barr*

## *Streamlining Windows*

#### 7. AUTOSTART YOUR APPLICATIONS THREE WAYS

Windows 3.1 gives users three different ways to fire up applications automatically on boot-up. New to 3.1 is a Program Manager group called Startup, which loads any items placed within it. Just drag and drop the icons or executables of the programs you want loaded and it's done for you every time you boot Windows.

The method that worked in Version 3.0—editing the WIN.INI file to add a run= or load= statement—still works, of course, and can be used in conjunction with the Startup group: The run= and load= statements are executed before the programs in Startup are launched.

If you're comfortable editing PROGMAN.INI, you can further customize the Startup group by making any chosen group launch its programs automatically. Simply place a Startup=''*any group name*'' statement under the [Settings] section. All the programs in the ''*any group name*'' group will be started in order of their position in the window.

Example from PROGMAN.INI:

```
[Settings]
Startup=''DOS Applications''
```

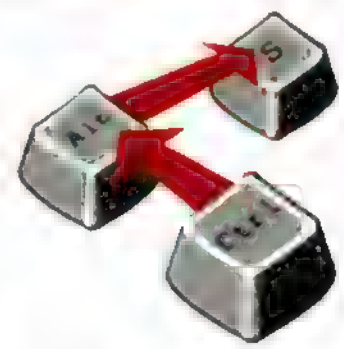
—*Christopher Barr*

#### 8. SHORT-CIRCUIT STARTUP GROUP

The new Program Manager Startup group is a great convenience—most of the time. There will undoubtedly be occasions, however, when you *don't* want to load your normal smorgasbord of applications. To start Program Manager without running the programs in Startup, simply hold down the Shift key as Windows starts (while the start-up logo is still on the screen).—*Craig Stinson*

#### 9. HOTKEY FROM APP TO APP

If you're accustomed to the speed and simplicity of keystroke task switching à la *Software Carousel* or *Headroom*—or you simply want to move as quickly and smoothly as possible between applications you use regularly—you'll be pleased to know that it's easy to do in Windows 3.0 or 3.1. The technique works for Windows and DOS apps alike.



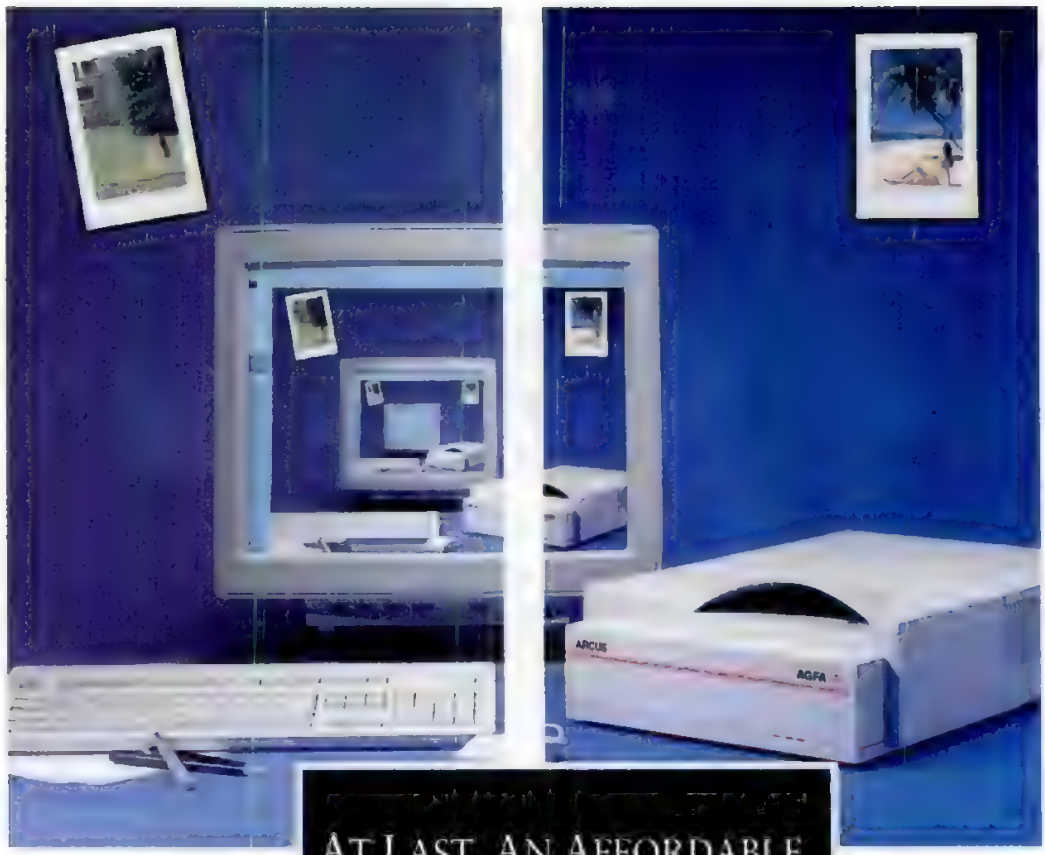
First, you'll need to set up a PIF for each application you wish to swap in this way. Access the PIF Editor, switch to the Advanced screen (screen two), and move your cursor to the last entry, a box titled ''Application Shortcut Key.''

Decide on a keystroke combination you will use to access the program you're setting up directly—Ctrl-S for your spreadsheet or Ctrl-W for your word processor, for example. (You may want to plan similar but distinctive combinations for all your apps.) Simply press the keys you have chosen and your hotkey combination is recorded. Possible combinations include Ctrl, Alt, and Shift in any combination plus any of the function or alphanumeric keys. That should give you hundreds to choose from.

Once your hotkeys are set up and the applications loaded, moving from one program to another is very rapid. If you are moving between DOS applications using the same screen mode, it's next to instantaneous.—*Ted Stevenson*

#### 10. FINE-TUNE CONFIG.SYS TO REDUCE UAEs

Many applications are simply unable to cope when the system denies a request to open a new file. When this happens, they crash; this is one major cause of UAEs (Unrecoverable Application Errors). By default, DOS loads with only seven file handles available for system and program use. The FILES= directive in your CONFIG.SYS file lets you increase this num-

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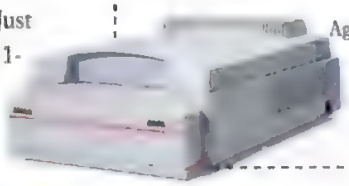

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CIRCLE 071 ON READER SERVICE CARD

ber at a cost of roughly 50 bytes per handle. Veteran DOS users have long since learned to include a FILES=20 statement in their CONFIG.SYS, but that's often not enough for Windows, which may have several applications open at once. Microsoft recommends FILES=50 or even 60. This abundance of file handles should all but eliminate UAEs resulting from this problem.

In Windows 3.0, you might want to add SHELL=C:\DOS\COMMAND.COM /E:1024 /P to your CONFIG.SYS (Windows 3.1 places this line in your CONFIG.SYS automatically during installation). This reserves 1K for the environment, a big increase over the DOS default. As with file handles, many DOS apps simply can't deal with *no* as an answer to a request for environment resources. The increased environment size reduces the likelihood of UAEs from this cause. Microsoft suggests you might even make the number as large as 2048.
—*Barry Simon*

#### 11. EASY SERIAL PORT MANAGEMENT UNDER 3.1

If you have three or four serial ports installed for communications programs, chances are two of them might be sharing the same IRQ (interrupt request) line. Occasionally, when you install serial cards and don't configure the switches correctly, port addresses repeat. Windows 3.1, however, makes managing ports COM1 to COM4 easier than ever.

To enable communications on more than one port concurrently, each serial port must be configured with a different port address and IRQ. You can check the port addresses and IRQs used by your serial ports with the Microsoft Diagnostics program (MSD) included with Windows 3.1. Run MSD from the DOS command line, and select the [C]om port and IR[Q] options from the menu. If two serial ports are using the same port address or IRQ, you may be able to reconfigure the hardware by changing jumper settings or switches on the appropriate serial I/O cards.

Once the corrections are made to the port address and IRQ values for each serial port, inform Windows through the Control Panel. Select Ports from the Control Panel and click on the number of the comm port you want to configure. Select Settings and then Advanced. . .to see the port address and IRQ value. Two pull-down menus allow you to specify the hexadecimal port address and the IRQ.—*Lenny Bailes*

**Win 3.1's Control Panel setup forms make it super easy to convey correct COM port settings to Windows.**

#### 12. FINE-TUNING LOGITECH MICE

If you own a Logitech bus mouse or an earlier two-button Logitech serial mouse, Windows 3.0 will identify these as "Microsoft or IBM PS/2 Mouse," and use Microsoft's compatible mouse driver. (Windows 3.1 ships with a driver for Logitech's latest mice.)

If you are using an older Logitech three-button serial mouse or trackball, Windows may fail to recognize it unless you run the Logitech setup program bundled with the pointing device. For Windows 3.0, the drivers on the Logitech OEM disk should replace the buggy LMOUSE.DRV in the \WINDOWS\SYSTEM directory. With 3.1, the drivers supplied by Microsoft should work with any Logitech mouse, though the drivers on the OEM floppy disks provide enhanced features for controlling the shape and speed of the mouse cursor.

On some systems, users of C-7 and C-9 Logitech serial mice may encounter problems with an erratic pointer when switching from a DOS application back to Windows in Enhanced mode. These problems may be resolved by running the Logitech mouse driver before starting Windows.—*Lenny Bailes*

#### 13. THE BEST SWAP FILE MAY BE NO SWAP FILE

Generally, you will achieve the best performance under Windows by establishing a permanent swap file. This allows Windows to *page* information to and from disk faster than it would with a temporary swap file. However, you can make Windows run faster by disabling the swap file entirely. The drawback to this technique is that you will have no virtual disk memory and Windows will be limited to the extended memory available on start-up. If you have only 1MB to 2MB of extended memory available, you may get "out of memory" messages if you attempt to open more than one window for DOS. If you have plenty of extended memory available—say 8MB or more—or plan to run only one or two applications during a session, you should have no problems. Windows will definitely run faster without a swap file.

In Windows 3.0, the swap file may be disabled by first running Windows in Real mode and using the SWAPFILE.EXE utility to remove any prior permanent swap file. Then the following line must be inserted with a text editor into the 386 Enhanced section of SYSTEM.INI:

```
Paging=No
```

In Windows 3.1, the swap file may be disabled by running Windows in Enhanced mode, opening Control Panel, and selecting the 386 Enhanced icon. Click on Virtual Memory and select None under Type.

If you decide you do need a temporary or permanent swap file, it can be created via the same utilities. In 3.0, however, the default setting for a temporary Windows swap file allows it to consume all but 512K of the space on the specified drive. This may be inconvenient if you want the drive that houses the swap file to remain free for file storage. You can instruct Windows to allow a specified amount of

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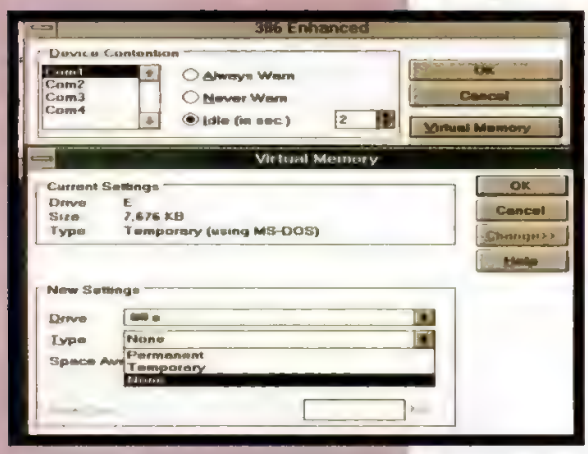



**Creating or altering a swap file is easy in Win 3.1. Just click on 386 Enhanced in the Control Panel, then click the Virtual memory button and enter your setting. Reboot your system afterward.**

space to remain unused by a temporary swap file. This is done by editing the MinUserDiskSpace setting in the 386 Enhanced section of SYSTEM.INI. Use a text editor to enter the following line in the 386Enh section:

```
MinUserDiskSpace=<kilobytes of disk
space you want free for storage>
```

The default is up to half of the free disk space if no value is entered, but Windows will use whatever value you specify for this parameter.—*Lenny Bailes*

### 14. BYPASSING THE WINDOWS SIGN-ON LOGO

Tired of staring at the Windows logo every time you boot the program? It's easy to turn it off. If you boot Windows from the DOS command line, add a space and a colon to the command: WIN_: <Enter>. Windows will load and the first thing you'll see will be the desktop. If you use a DOS batch file, add the space and colon to your batch file. You'll never have to see the sign-on logo again. Though it makes it easier on the eyes, a space and a colon will not speed up the loading of Windows. You'll just see a blank screen where the logo was.
—*Ted Stevenson*

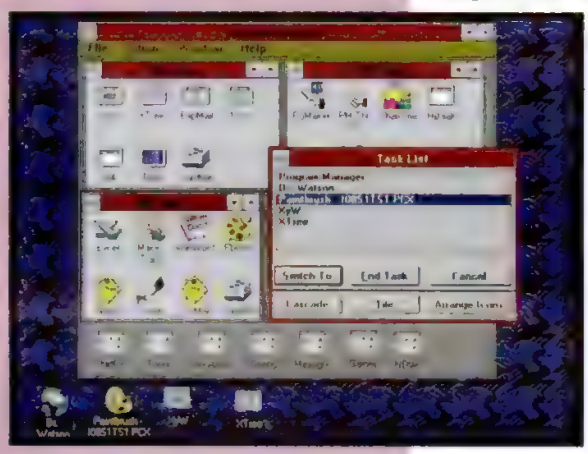
## *Customizing Windows*

### 15. REASSIGN TASK MANAGER TO ANOTHER APPLICATION

If you've never double-clicked on your wallpaper or hit Ctrl-Esc, you should give it a try. It brings up the Windows Task Manager, a list of up-and-running applications that lets you switch from one to another, point-and-shoot style. If Task Manager works for you, great. But what if you just couldn't care less? Wouldn't it be nice if you could cause the same double-click or Ctrl-Esc to run a program of your choice? You can!

Let's say you'd like it to bring up the Control Panel. All you need to do is edit your SYSTEM.INI file and look for the following at or near the top:

```
[boot]
taskman.exe=taskman.exe
```

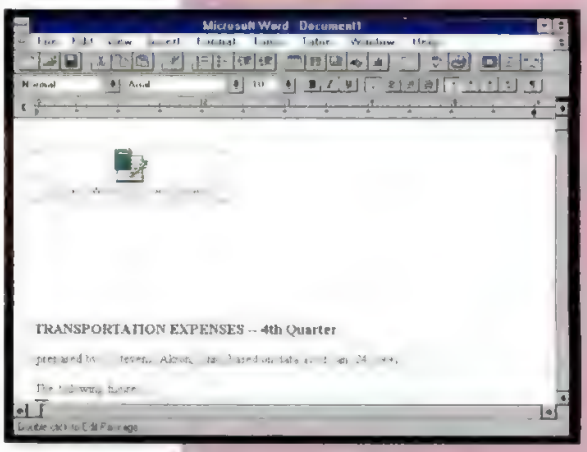



**The Task List, accessed by double-clicking on the desktop, is just one way of switching applications in Windows. The keystroke sequence can easily be assigned to another program, such as the calculator.**

Simply change the right side of the equal sign to refer to the program you want to run when you hit Ctrl-Esc:

```
[boot]
taskman.exe=control.exe
```

You can place any Windows application on the right side of the equal sign. Perhaps you'd like a utility at your fingertips. In that case, Notepad, Calendar, and the Calculator are other possibilities to consider for easy access. Better yet, try Minesweeper!
—*Fran Finnegan*




**The new Object Packager accessory can turn data and programs into packages that you can save in any OLE client application.**

### 16. PACKAGING PROGRAMS WITH OLE

Object linking and embedding (OLE) wasn't introduced in Windows 3.1. Applications like *Microsoft Word for Windows* and Lotus' *Ami Pro* have already made this data-sharing technique available. However, Windows 3.1 adds a utility, Object Packager, that will allow you to turn almost anything into an OLE package.

While it was designed to give you more control over embedded data, you can also use Object Packager to embed a program in a document. You could, for example, turn the Windows Calculator into a package and paste it into a frequently used document. Then, instead of switching to Program Manager

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CIRCLE 258 ON READER SERVICE CARD

whenever you need to work with numbers, you'd be able to click on the icon that's already in your document and use the Calculator.

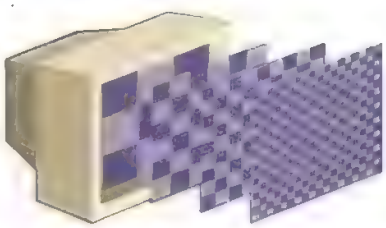
To create the package, open Object Packager from the Accessories window, click on the Content window, then select Command Line on the Edit menu. Enter the name of your program (in our example, CALC.EXE).

Now, click on the Appearance window; click on the Insert Icon command button and choose an icon. You're not limited to the Calculator's original icon; you can even change the icon source file. The default file is Program Manager. Try using icons from the MORICONS.DLL.

Then, give the package a description using the Label command, and click on Copy Package. This technique creates a linked object, so the data file won't become enormous. In *Microsoft Word for Windows*, embedding the calculator added about 5K to a document file.

—*Gus Venditto*

### 17. MULTIPLE SCREEN RESOLUTIONS FOR WINDOWS 3.0



The default setup for Windows on a standard VGA system uses a display resolution of 640 by 480 pixels with 16 colors. If your display and video card permit, you may want to run Windows in a higher resolution or use more screen colors. If you want to run Windows 3.0 in multiple screen resolutions (640-by-480 with 256 colors, 1,024-by-720 with 16 colors, and so forth), it's faster to store multiple configurations of WIN.INI and SYSTEM.INI in your WINDOWS directory than to rerun the Setup procedure each time you make a change. This technique is also useful for alternative Windows configurations with third-party file managers and custom colors for the desktop. (In 3.1, with its improved Setup facility, it's faster and simpler to use Setup.)

When you arrive at a Windows configuration that you want to keep, copy WIN.INI to a file named WIN1.INI, and SYSTEM.INI to a file named SYS1.INI. If you plan to use different desktop patterns or colors, copy the file named CONTROL.INI to CON1.INI, as well. (Windows' File Manager is a good place to do all this.)

Now, make any changes you want to Windows, using Setup, Control Panel, or a third-party file manager. When you find the second configuration that you want to keep, copy the new WIN.INI, SYSTEM .INI, and CONTROL.INI to WIN2.INI, SYS2.INI, and CON2.INI.

You can choose which Windows configuration to run by constructing a menu with DOS batch files:

```
WMENU.BAT:
CD\WINDOWS
Type WMENU.TXT
```

Create the text file, called WMENU.TXT, for the menu using your favorite word processor. In it, type:

```
''Select a Configuration and Press
Enter''

1. 640-by-480 resolution, 256 colors

2. 1,024-by-768 resolution, 16 colors

3. 640-by-480 resolution
with The Norton Desktop
```

Then create a batch file for each choice on the menu:

```
1.BAT:
COPY WIN1.INI WIN.INI
COPY SYS1.INI SYSTEM.INI
COPY CON1.INI CONTROL.INI
WIN

2.BAT:
COPY WIN2.INI WIN.INI
COPY SYS2.INI SYSTEM.INI
COPY CON2.INI CONTROL.INI
WIN
```

—*Lenny Bailes*

### 18. REPLACING THE WINDOWS SIGN-ON LOGO

Would you like to replace the Windows sign-on with your own custom logo? It's not difficult.

When Setup installs a new video driver, it also rebuilds the start-up module—including the logo. If you have VGA, it will take the logo from a file called VGALOGO.RLE. To substitute an image of your choice, simply give that filename to your image.

First, though, you'll need to convert your image file into .RLE 4-bit format, a variant of .GIF. If you don't have a graphics file-format conversion package, get your hands on *WINGIF*, a $15 shareware program that converts files from .PCX format to .RLE.

Now find VGALOGO.RLE in your WINDOWS\SYSTEM subdirectory, make a backup copy (in case you have problems and have to return to the original), and copy the new .RLE to its name. Return to the Windows subdirectory and run Setup from the DOS command line. Change your video driver to a different one, exit, and run Setup again, returning to your preferred driver. You should find that the logo has been replaced.

—*Barry Simon*

### 19. SAVE YOUR SETTINGS WITHOUT EXITING

Getting your Windows display arranged just the way you want is no trivial task. After you settle on the right mix of program groups and organize them just the way you want to see them on the desktop, you've got to quit, with the Save Settings option box checked, and then start Windows over again, *and* make sure you remember to deselect the Save Settings option. Otherwise, when you come in the next morning, it's like starting the day with yesterday's messy desk.

Fortunately, Windows 3.0 can be easily tricked into saving your settings without exiting. (Things get even easier with Windows 3.1 as you can see in Tip 20.)

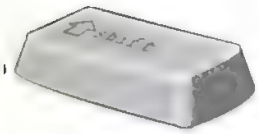
First, open a DOS application or a DOS command line session. Then, switch back to Program Manager. Carefully arrange your program groups and icons so that everything is set up just right. Now, exit Windows (double-click the Control menu or press Alt-F4), click the Save Settings check box on the Exit dialog. Finally, click OK.

After a bit of hard disk activity, an error-message dialog box will appear, telling you that Windows can't close because there's an active DOS session. You are now almost done. Windows has already updated the .GRP files, where it stores program group information, and the PROGMAN.INI file, where it keeps

the status for program group windows (the disk activity).

You can press Esc to clear the message, initiate the exit procedure again, deselect Save Settings on Exit, cancel, and go on about your business. Tomorrow morning, Windows will open with your carefully planned and laid out desktop, not the disheveled result of tonight's work.—*Gus Venditto*

#### 20. USE SHIFT KEY TO SAVE CHANGES




To save your Program Manager configuration without exiting the program in Windows 3.1, simply hold down the Shift key while choosing File Exit. This obviates the need to use the Save Settings on Exit switch under Options and makes saving much simpler and quicker. You may think nothing has happened, since no messages appear, but if you check by exiting and reloading Windows, you'll find that the settings are saved.—*Craig Stinson*

## *Utilizing and Maximizing Windows Resources*

#### 21. RUN YOUR DISK CACHES IN EXTENDED MEMORY

When running a software disk cache with Windows, use extended, not expanded, memory. Windows tends to be more stable if there are no DOS expanded memory programs loaded before you start it up. If you are using the SMARTDrive disk cache included with DOS or Windows, extended memory is the default.

With Multisoft's disk-caching software, *Super PC-Kwik,* the command line setting for SUPERPK.EXE should contain the /E, /EM, or /EP parameter instead of the /A or /A+ parameter. If you are running the bundled keyboard, screen display, and spooler utilities, their lines in POWERON.BAT should each include the parameter /&A-. These same parameters apply to the OEM versions of *Super PC-Kwik* bundled with DR DOS 6.0, and Qualitas's *386MAX.*

For Hyperware's *HyperDisk,* don't use the HYPERDKE.EXE module, use HYPERDKX.EXE, HYPER286.EXE, or HYPER386.EXE.—*Lenny Bailes*

#### 22. WHEN TO CHOOSE STANDARD MODE

To get maximum performance out of applications like *PageMaker* or *CorelDRAW,* you may want to run Windows in Standard mode, provided you have at least 2MB to 3MB of extended memory available after Windows loads. You will not be able to multitask DOS programs in Windows' Standard mode, but you can still use Windows as a DOS task switcher to switch back and forth between DOS and Windows programs.

You may also want to run Windows in Standard mode if you use Quarterdeck's *QEMM* and wish to run DOS-extended programs like *AutoCAD, Mathematica,* and *Paradox* 3.5. Windows does not permit you to launch these programs from Enhanced mode, but with *QEMM-386*'s ability to take advantage of DPMI (DOS protected-mode interface) support, you can launch them from Windows running in Standard mode.—*Lenny Bailes*

#### 23. CLOCK LIMIT RUNAROUND

In Windows versions prior to 3.1, users could open as many copies of the Windows Clock as they desired. Because the Windows 3.1 clock is designed to remember its last position on the screen, only one copy can be opened at a time. This may be disappointing to users of virtual screen utilities like HDC File Apps, More Windows, or Big Desk. These utilities allow users to pan between multiple screens of Windows applications. Users may want to keep a copy of the clock running on more than one virtual screen.

If you have Windows 3.0, you can use its clock program in Windows 3.1 simultaneously with the newer version. There is no limit to the number of 3.0 clocks you can open in a session. Rename the Windows 3.0 clock program CLOCK30.EXE and copy it to your Windows 3.1 directory along with its font file (DIGITAL.FON). You may now open one copy of the 3.1 CLOCK.EXE and multiple copies of CLOCK30.EXE as you need them. —*Lenny Bailes*

**The Win 3.1 clock can be used only in a single session. The Win 3.0 clock, however, is totally compatible and can be used in any number of sessions.**

#### 24. USE 3.1'S BUILT-IN VGA DRIVERS

Windows 3.1 has built-in support for Super VGA graphics at 800 by 600 pixels with 16 colors. For higher Super VGA resolutions or deeper color palettes, you may be able to use an OEM driver pack written for Windows 3.0. (This is particularly true of video cards like the Orchid ProDesigner II and others that use Tseng Laboratories' 4000 chip set.)

To get Windows 3.1 to recognize your 3.0 driver pack, rename any file called SETUP.INF on the OEM floppy disk to OEMSETUP.INF. (Be sure to back up your original disk first.) You can upgrade to 1,024 by 768 pixels, or any other supported screen resolution by running the Windows 3.1 Setup program from DOS and choosing the Other driver option under Display. Setup will ask for the OEM disk.—*Lenny Bailes*

#### 25. SMARTDRIVE DOES THE TRICK NOW

Always use a disk cache to speed up Windows. If you have *Super PC-Kwik,* you don't need to read this, but if you have been using the SMARTDRV.SYS that came in Windows 3.0, you've been hobbling around on one leg.

SMARTDrive in Windows 3.1 is a real disk cache now. While the older

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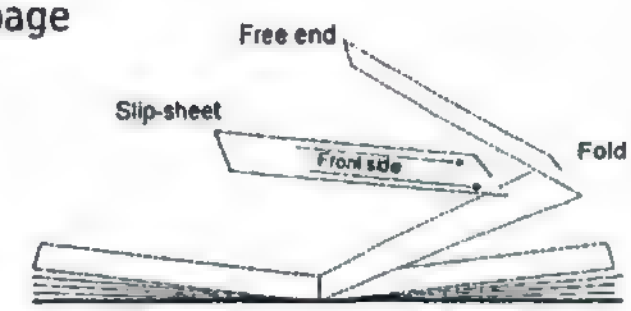


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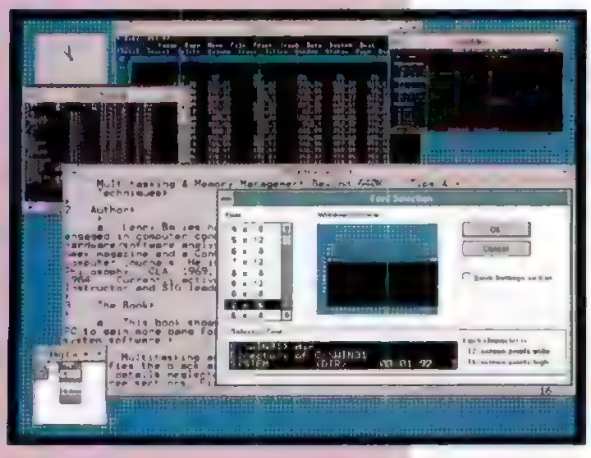
version was a read-only cache, the new SMARTDrive caches writes as well as reads. It uses about 28K of memory and loads automatically into upper memory if you use DOS 5 and have upper memory blocks configured.

Because SMARTDRV.EXE is an executable file and is run from AUTOEXEC.BAT, you don't need to edit CONFIG.SYS and reboot to change options; you can easily set options at any DOS prompt. (Type SMARTDRV /? at the prompt to see a summary of options.) You can also view the status of your system's caching by typing SMARTDRV at the DOS prompt.—*Christopher Barr*

### 26. RUN DOS APPS IN FOREGROUND FOR BEST PERFORMANCE

If your DOS applications run sluggishly in Windows' 386 Enhanced mode, try setting them to run only in the foreground. It's unlikely that a DOS word processor or file management utility needs to remain active in the background (unless you want to print while you use other applications). A DOS application's foreground/background performance is controlled by its PIF setting.

The PIF Editor has two settings on its first screen: Background and Exclusive. If neither box is checked, then DOS applications will suspend operation when you switch to another window, allowing maximum CPU time for the active window. Keep in mind that if you disable background operation for an application, the application will not print documents, recalculate data, or perform other tasks when you switch away to perform another task in the foreground. Any task that was in progress when you switched will be resumed when you designate the application as the active window again.
—*Lenny Bailes*

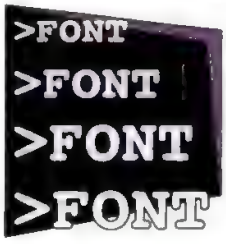


Windows 3.1 gives users a choice of nine different text-font sizes for DOS applications running in small-screen windows. Opt for maximum readability or more information on-screen.

## *Working with DOS Applications*

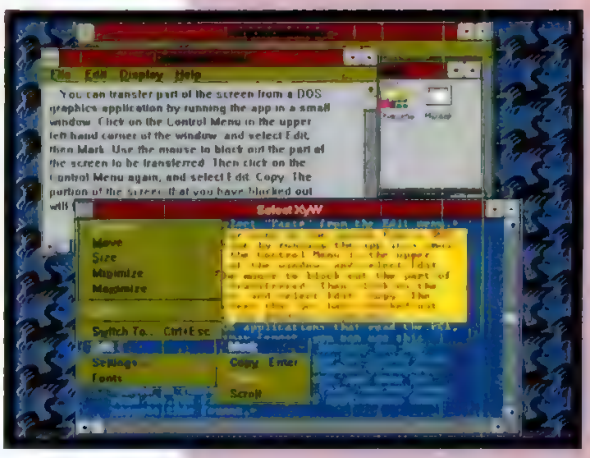
### 27. FLEXIBLE FONT SIZES FOR WINDOWED DOS APPS

Windows 3.1 lets you adjust the size of the DOS screen font for applications running in small windows in Enhanced mode. This feature is particularly useful if you have difficulty reading the default text size at Super VGA resolutions. On the other hand, you might prefer to use smaller screen fonts, which let you see more information at once.




"Window" a DOS application after opening it by hitting Alt-Enter. To change font size, click the Control menu (located in the upper-left-hand corner of the Windowed DOS app) and select Fonts. This opens a menu of available DOS screen fonts and sizes. A preview window shows how font selections affect readability and the size of the application window. The font dimensions indicate the height and width in pixels of the font matrix.

When you exit Windows, remember to check the Save Settings box and the font size you've chosen will be your new default size in Windowed DOS apps.
—*Lenny Bailes*



You can copy portions of graphics or text screens from DOS apps running in small-screen windows to the Windows Clipboard. Just mark with the mouse and select Edit, Copy from the Control menu.

### 28. CLIPBOARD TRANSFERS GRAPHICS FROM DOS TO WINDOWS APPS

It's fairly common knowledge that you can transfer text from Windows to DOS applications using the Windows Clipboard. Less well known, however, is the fact that when running in 386 Enhanced mode, you can use the Clipboard to transfer bitmapped graphics from a DOS application to a Windows application.

To transfer a full-screen bitmapped graphic from a DOS application to the Windows Clipboard, simply display it in the DOS application while under Windows and press the PrintScreen key. Now return to Windows, and you can paste the graphic into any Windows application that accepts bitmaps. For instance, open Paintbrush and select Paste from the Edit menu.

You can transfer part of the screen from a DOS graphics application by running it in a small window. Click the Control menu, select Edit, then Mark. Use the mouse to select the portion of the screen to be transferred. Then click the Control menu again and select Edit, Copy. The portion of the screen that you have selected will be copied to the Windows Clipboard.

If you have DOS applications that read the PC Paintbrush bitmap format (.PCX), you can also use this technique to transfer screens between two DOS applications under Windows. Copy the screen from the first application to the Windows Clipboard, paste it into Windows Paintbrush,

and save the screen in Paintbrush as a .PCX file. You may then read the file into any DOS application that accepts this format.—*Lenny Bailes*

### 29. MOUSE USE IN SMALL WINDOWS

Windows 3.1 allows DOS applications to make use of the mouse in both full-screen and small windows. To take advantage of this feature, you must run a DOS mouse driver supplied with 3.1 before starting Windows. With Microsoft mice, use the MOUSE.SYS or MOUSE.COM files included with Windows 3.1. With Logitech serial mice, use LMOUSE.COM.

If a DOS application under Windows still won't recognize the mouse, try shifting to a full-screen window. If the mouse isn't recognized in a full-screen window, try a batch file to run the DOS mouse driver. For example, if you normally start *PC Tools*' PCSHELL with a file called PCSHELL.PIF, edit PCSHELL.PIF with the PIF Editor to use the following SHELL.BAT batch file:

```
MOUSE.COM (or LMOUSE.COM)
[d:]\path\PCSHELL.EXE
```

Under Program Filename in the PIF Editor, substitute SHELL.BAT (or whatever you want to name your batch file) for PCSHELL.EXE to run PCSHELL with your mouse.—*Lenny Bailes*

### 30. USE PRINTSCREEN FOR DOS SCREEN CAPTURES

There is a thriving market in Windows screen capture programs for those who need screenshots for training or software manuals. Few users seem aware, however, that an excellent screen capture program is built into Windows itself. Hitting the PrintScreen key will capture your current screen to the Clipboard in full color (Alt-PrintScreen will capture the active window). Open Paintbrush and paste the screen in from the Clipboard and you can save it in .PCX or .BMP format. Be sure to check the preferences (Options, Image attributes) and save options (File, Save As) or you could wind up with a black-and-white screen capture by accident.

If you have a lot of screens to capture, you may of course prefer a third-party program that automatically saves directly in .PCX or .TIF format, thus simplifying the process. But for occasional use, Windows and PrintScreen do fine. —*Barry Simon*

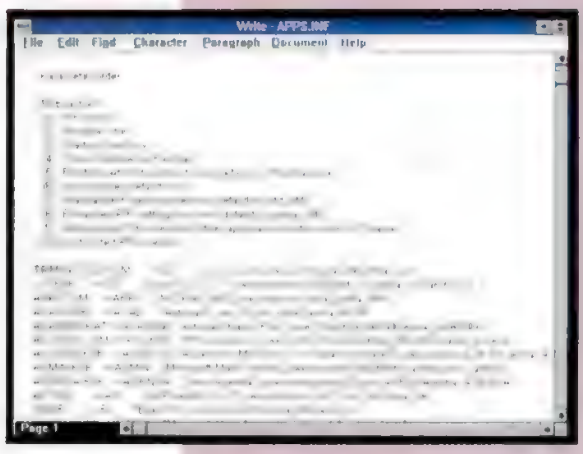
### 31. MAKING PIF SETTINGS UNIFORM

Building the perfect PIF for your DOS programs is no easy task. Some PIF settings are a reflection of personal work habits, while others reflect the standards of your office environment.

If your coworkers tend to use the same programs, run into the same conflicts, and have similar priorities, you might want to distribute PIFs for their DOS programs, so that everyone can take advantage of the best settings.

When just one or two applications cause problems, it's easier to distribute the associated PIFs as individual files, but if there's a wide variety, it may be more efficient to edit the file that Setup uses to create new PIFs, and distribute just that one file.

Microsoft distributes PIF settings in a text file called APPS.INF, which uses a format similar to WIN.INI. It's stored in the \WINDOWS\SYSTEM directory.




APPS.INF is the file where Windows stores the information Setup uses when creating icons and PIFs for your DOS programs. This section defines the settings for popular DOS programs.

When you tell the Setup program to prepare the DOS programs on-disk, it reads APPS.INF, and builds new PIFs for each DOS program that it finds.

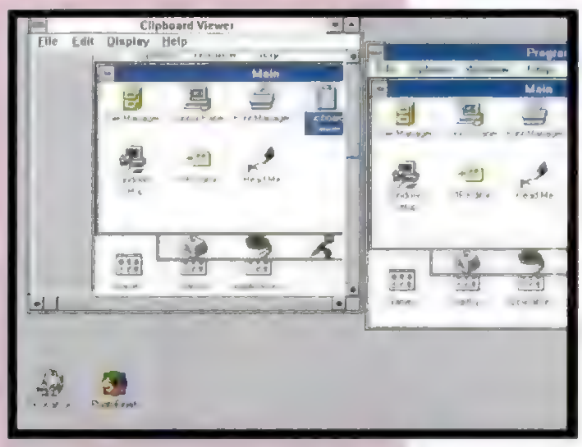
If you write and distribute your own applications, you may want to add optimal PIF settings for your software. Then you can provide a new version of APPS .INF with the program so that Setup will know how to install your software.

If you've distributed an application in your company, you can add new PIF settings for it to the APPS.INF file. Then, anyone using the Setup program in the future will get the proper settings. Editing APPS.INF, like editing WIN.INI or SYSTEM.INI, must be done carefully.

Open APPS.INF with any text editor. There is documentation within the file to guide you through the syntax. Make sure you save a backup of the APPS.INF before you start.

Look for the section that begins 123.COM= 123; this is the section that tells Setup to look for a program named 123.COM and to create a PIF with the name 123.

Make changes carefully. All of the DOS program entries are in alphabetical order; if you move a program name out of order, Setup won't be able to find it.




Tapping PrintScreen in Windows saves the current screen to the Clipboard. Here you see Windows 3.0's Program Manager next to the Clipboard Viewer showing the captured screenshot.

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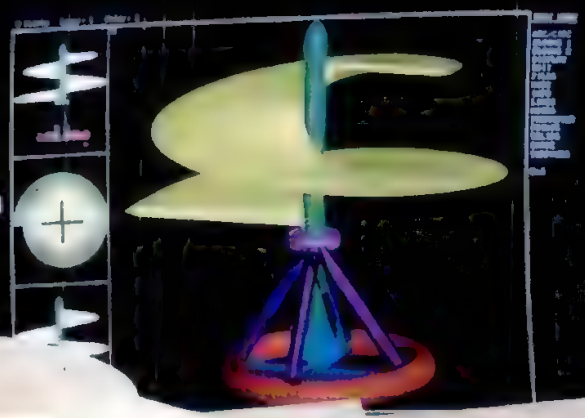

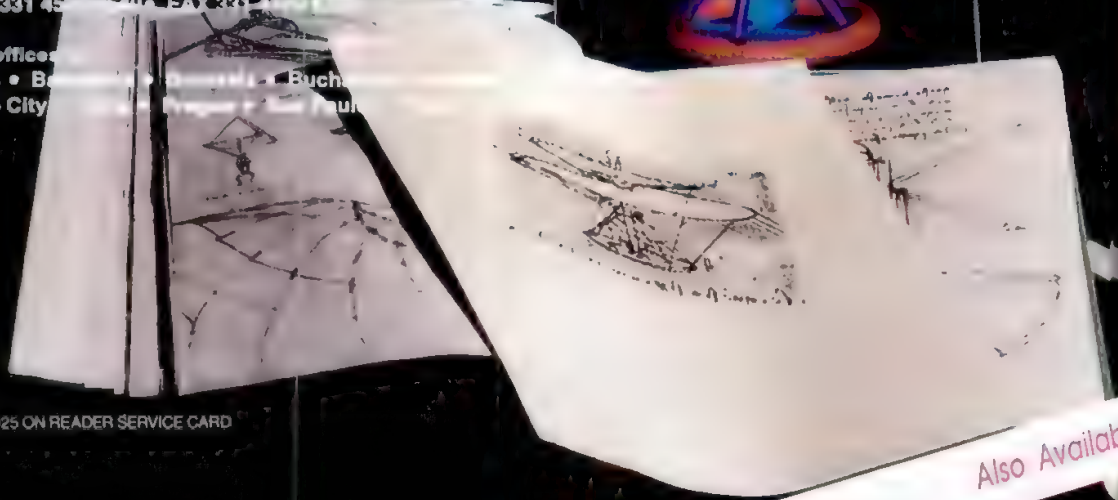

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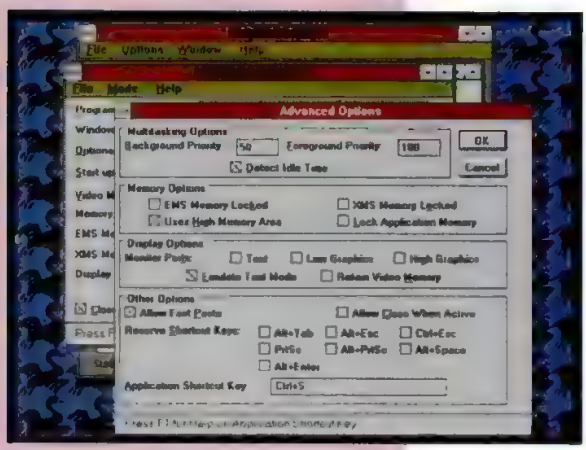
The PIF settings are stored as a series of parameters, separated by commas. To change settings for an application already listed, refer to the section called "parameter order"; it appears just above the main body of program name listings.

Many of the programs' settings are just a series of letters and numbers that represent PIF settings. Some refer to specialized groups of settings that are summarized at the bottom of the file under headers that appear in brackets.

To add a new application, start by copying the settings for a program that you know is similar, and then edit carefully.—*Gus Venditto*

### 32. PROTECT CONTROL-KEY SEQUENCES IN DOS APPS

Windows uses seven key combinations—primarily Alt-key combinations—as keyboard shortcuts. This is great for Windows users who prefer the keyboard to the mouse, but not so great for DOS app users who utilize these same combinations. The good news is that Microsoft has provided for these users. Toward the bottom of the Advanced screen of the PIF Editor is a section titled "Reserve Shortcut Keys." All seven combinations are listed there. To reserve a combination for your app, just check the appropriate box. Windows will no longer interpret the keystrokes as a Windows command but will let them talk to your application.
—*Ted Stevenson*



Users intrepid enough to venture to the PIF Editor's Advanced Options screen will be rewarded by being able to set up hotkeys to switch instantly between their applications.

## *Fonts and Printing*

### 33. CONVERT COREL FONTS FOR GENERAL WINDOWS USE

Users of Corel Systems' *CorelDRAW* have hundreds of extra PostScript typefaces potentially at their disposal. Corel's fonts are stored in a proprietary format, but the WFNBOSS utility included with *CorelDRAW* can convert Corel typefaces into Adobe Type I format for use with other Windows applications. Here's how it works.

First, export the Corel (.WFN) typeface in Adobe Type I (.PFB) format by selecting "Corel to Adobe Type 1" under Conversion Type in the WFNBOSS window. This creates auxiliary .PFM and .AFM metric files.

If you are using *Adobe Type Manager*, WFN-BOSS automatically selects \PSFONTS\PFM\ as the destination directory for the fonts. All that remains is to open *ATM* and add the newly exported faces.

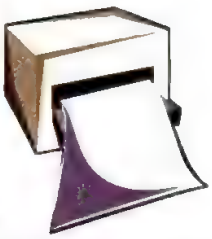
If you don't use *Adobe Type Manager*, you may install the new Type I font manually by editing the appropriate printer section in WIN.INI. For example, if you have just converted AVALON .WFN, copy the new AVALON.PFB and AVALON.PFM files to appropriate PSFONTS and PFM directories on your hard disk. For a PostScript printer on COM1, add the following information to WIN.INI:

```
[PostScript,COM1]
sfdir=c:\psfonts [or
any directory specified
for font storage]
softfonts=1
softfont1=c:\psfonts\pfm\
avalon.pfm,c:\psfonts\
avalon.pfb
```

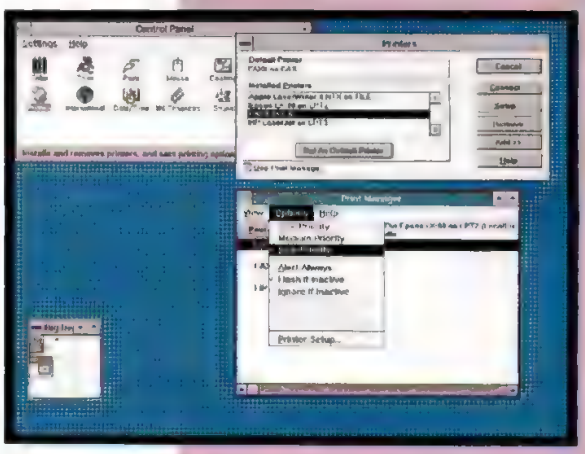
This setting causes Windows to download the Avalon font each time it is called from an application. If you have a DOS font downloader, AVALON.PFB can be downloaded to the printer before starting Windows, as explained in Tip 33.

After editing WIN.INI, as described previously, restart Windows. To make the font appear on an application's Font menu, rechoose the appropriate printer, with the Printer Setup command in the application's File menu.
—*Lenny Bailes*

### 34. REPRIORITIZE OR DISABLE PRINT MANAGER FOR SPEEDIER PRINTING



First the good news: Windows 3.1's print speed with supported printers is nearly three times as fast as Windows 3.0. The bad news? That can still be a long time.



Setting Print Manager's priority to High is one way to speed up Windows printing.

One way to speed up printing is to disable or change Print Manager's printing priority. (Print Manager is Windows' built-in spooler.)

After a default installation, Windows sets the Print Manager to "Medium Priority" for print jobs. You can set it to "High Priority" by selecting the Print Manager icon from the Main group window and changing the setting from the Options menu.

If you use a third-party print spooler, try disabling the Print Manager to make Windows print faster. Open the Control Panel, select Printers, and deselect the "Use Print Manager" box at the bottom of the screen. This may also speed up printing in networked environments.
—*Lenny Bailes*

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*In Windows 3.1, the size, style, and typeface of icon titles can be changed.*

### 35. REMAPPING REDUNDANT FONTS

Is it possible to rename font names (typefaces) so that you can map some program's Dutch to ITC Times Roman? You bet it is!

Look for the following new section in your 3.1 WIN.INI file:

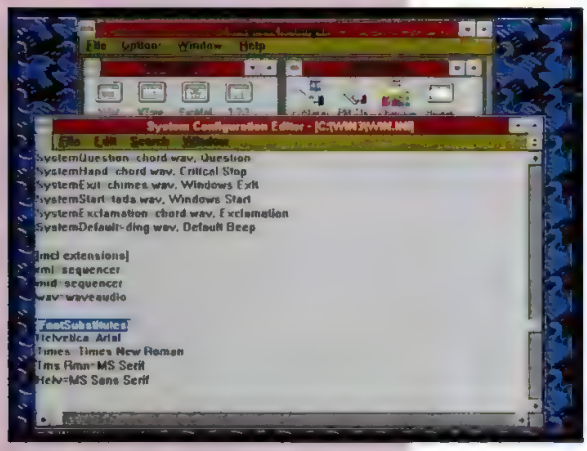
```
[FontSubstitutes]
Helv=MS Sans Serif
Tms Rmn=MS Serif
Times=Times New Roman
Helvetica=Arial
```

The purpose of this new WIN.INI section is to provide an automatic way for 3.0 applications to use the new TrueType fonts that come with 3.1. The left side of the equal sign is the old 3.0 name. When a 3.0 application asks for one of these fonts, Windows maps the name and returns the corresponding TrueType (or other) font on the right side.

To this [FontSubstitutes] section, all you need to do is add the following entry (with names specific to the font you are mapping, of course):

```
Dutch=ITC Times Roman
```

After restarting Windows, requests for Dutch will be interpreted as requests for ITC Times Roman, and that font will be returned to the application. This, of course, presumes that you indeed have ITC Times Roman (or whatever font is on the right side of the equal sign) installed in 3.1. If you don't, Windows will return the nearest font that matches it, based on a complicated formula internal to Windows.
—*Fran Finnegan*




**Font calls for older Windows applications can be easily mapped to more up-to-date fonts by editing the FontSubstitutes section of the WIN.INI file.**

### 36. PREDOWNLOAD POSTSCRIPT FONTS FOR FASTER PRINTING

Windows can download soft fonts to a PostScript device each time you print, or be configured to expect fonts to be preresident in the printer. You can save on printing time if Windows' on-the-fly font downloading feature is disabled.

Each Windows output device has its own section in WIN.INI. The font list under each printer section controls how soft fonts are treated for that device. A font name listing with a .PFM extension makes the font available on menus in each individual Windows application. An additional listing on the same line with a .PFB extension tells Windows to download the printer font file each time the font is called for a print job.

For example, the following section in WIN.INI tells Windows to download Caslon Roman and Franklin Gothic from your hard disk every time you print:

```
[PostScript, LPT1]
sfdir=c:\psfonts
softfonts=2
softfont1=c:\psfonts\pfm\
cfr_____.pfm,c:\psfonts\
cfr_____.pfb
softfont2=c:\psfonts\pfm\
frh_____.pfm,c:\psfonts\
frh_____.pfb
```

Your WIN.INI is likely to have listings like this if you've installed soft fonts with *Adobe Type Manager* 2.0, ZSoft's *Softtype*, or Bitstream's *FaceLift for Windows*.

To speed up your Windows PostScript printing, disable Windows font downloading by removing the .PFB listings from the printer section in WIN.INI as follows:

```
[PostScript, LPT1]
sfdir=c:\psfonts
softfonts=2
softfont1=c:\psfonts\pfm\cfr_____.pfm
softfont2=c:\psfonts\pfm\frh_____.pfm
```

If your WIN.INI file is edited as shown here, Windows will assume that Caslon and Franklin Gothic are resident in the printer and won't attempt to download them again. You must make the fonts resident in the printer before starting Windows by running a download batch file.

Adobe Systems provides two DOS font downloaders in its *Type Library* packages. PSDOWN.EXE is used to download soft fonts to a serial printer, PCSEND.EXE is used to download soft fonts to a parallel or AppleTalk printer.

The following is a sample batch file that predownloads Caslon Roman and Franklin Gothic to a printer on LPT1:

```
PCSEND -1 -v c:\psfonts\cfr____.pfb
PCSEND -1 -v c:\psfonts\frh____.pfb
```

Run Adobe's PSDOWN program (or another third-party equivalent) when using a serial interface printer. Starting PSDOWN brings up a menu-driven interface. Select the fonts to be predownloaded from the menu and press D. (If you're downloading to the printer's hard disk, press M first, followed by D.)
—*Lenny Bailes*

### 37. CHANGE ICON-TITLE FONTS

The titles Windows uses beneath the screen icons use an 8-point sans serif font by default. Now, in Windows, Version 3.1, the size, style, and typeface can all be changed.

To do this, simply edit your WIN.INI files and add any of the following lines:

```
[Desktop]
IconTitleFaceName=MS Sans Serif
IconTitleSize=10
```

You can choose between three fonts: MS Sans Serif, Courier, and MS Serif. Size choices are 8, 10, 12, 14, 18, and 24

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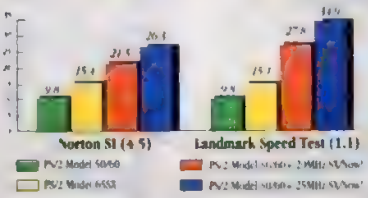


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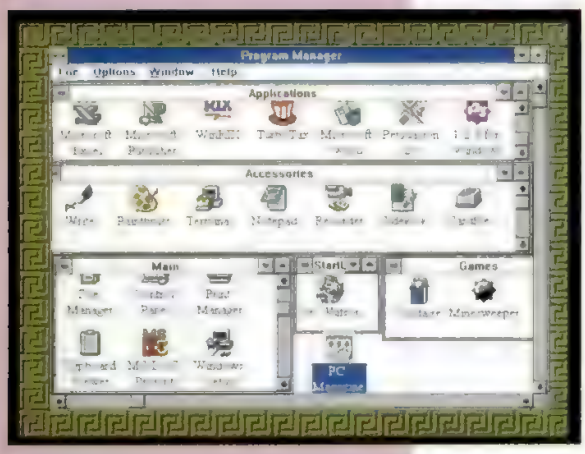



Windows defaults to an 8-point sans serif font for program icon titles. Here, these titles have been changed to 10-point MS Serif. The larger font size makes the titles easier to read.

points. (10 and 12 points are probably the most viable alternatives to the default 8-point size.)—*Christopher Barr*

## *Troubleshooting Windows*

### 38. EXPOSE SETUP FAILURES WITH /L

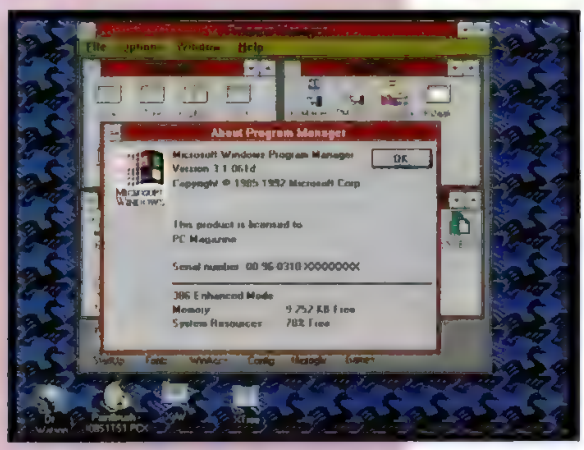
Microsoft learned a lot from the great UAE blitz that accompanied Version 3.0. Now, with Version 3.1, the company has put many safeguards in place to make the process of installing and running the program less daunting. If you come to grief in the installation process, run the Setup program from the command line with the /L switch (a:setup /L). This won't necessarily fix the problem, but it will provide information about where in the installation sequence the problem is cropping up. The /L switch tells Windows to keep a log of each step. The log records successful attempts and stops where the failure occurs. Armed with this information, technical support representatives should be able to diagnose the problem and prescribe a remedy.
—*Ted Stevenson*

### 39. END PROGRAM MANAGER RESOURCE DRAIN

Under Windows 3.0, you could have megabytes of free memory and still get out-of-memory messages or the sluggish performance associated with low memory. If you go to Help and select About Program Manager, at the bottom of the dialog you'll see a statement of Free System Resources, expressed as "X% Free." As you open more applications, that percentage will drop. Problems can occur when free resources drop below about 20 percent.

Under Windows 3.0, Program Manager itself is one of the biggest resource hogs, typically gobbling up between 25 and 40 percent of system resources, depending on the number of icons and groups that you have set up. If you stick with Version 3.0, consider installing an alternative shell to Program Manager—either the MSDOS .EXE supplied by Windows OnLine (Microsoft Windows' support on CompuServe) or a low-resource shell such as Wilson WindowWare's *Command Post* or hDC's *Power Launcher*.

However, the best advice for coping with this issue may well be to upgrade to 3.1. Changes were made in the new version to significantly cut down resource usage, and free resource problems are consequently much less frequent. Under 3.1, Program Manager's resource usage on my system has been only about 15 percent.—*Barry Simon*




To view the current state of system resources under Windows, click the About selection at the bottom of the Program Manager's Help menu. Many Windows apps offer the same information from their Help menus.

### 40. IT'S ELEMENTARY: USE DR. WATSON

Many Windows 3.0 users were plagued with UAEs—system crashes caused by . . . we never knew what. Even though there should be fewer UAEs under 3.1, they will undoubtedly still occur. For this reason, Microsoft has included a TSR utility called Dr. Watson to sleuth out what is actually happening when UAEs occur.

When a system crashes with Dr. Watson running, Dr. W records the state of Windows in a log file on the hard disk before you get the infamous UAE message. After you "OK" the error message, a dialog box pops up asking what you were doing, and your response is also placed in the log file. The information in the log—involving the active code at the time the UAE began, the states of certain CPU registers, and the handles of running programs—is too technical to be useful for most users. However, if the application vendor's tech support department requests it, the DRWATSON.LOG file can be forwarded to programmers who can make sense out of it. If a program crashes, offer the Dr. Watson log file to the tech support folks when you contact them.

Dr. Watson is included with 3.1 and is installed in your WINDOWS directory as DRWATSON.EXE. Drag it from File Manager to Windows 3.1's Startup group so it will always be there, running in the background—at least for the first few weeks. If you stick with Windows 3.0, you can download Dr. Watson from Microsoft's WINNEW forum Lib 1 as DRWTSN.ZIP.
—*Barry Simon*

### 41. AVOID DEATH-DEALING DOS COMMANDS

APPEND, ASSIGN, SUBST, and JOIN are all valid DOS commands, but all are likely to cause UAEs under Windows. All three are ways DOS has of tricking itself about drive designations or directories. Unfortunately, they also trick Windows—with disastrous results.

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APPEND sets up a search path for data files. ASSIGN allows you to give a logical drive name to a physical drive with another name. JOIN is only useful for systems with multiple physical hard disks—uncommon these days. SUBST lets you use a drive letter to refer to a directory. It's an economical way to create a search path with lots of directories while staying within DOS's 127-character limit for the AUTOEXEC.BAT PATH statement.

You might have a use for SUBST under Windows and might still be using the other commands out of habit, but Microsoft's recommendation is that you eliminate them from your repertoire. The latest Setup for Windows 3.1 actually scans your CONFIG.SYS and issues warnings if it finds any of these commands.—*Barry Simon*

### 42. CHECK FOR PRINTER CERTIFICATION

A major problem with Windows 3.0 driver support was that you were left to the mercy of printer manufacturers in how they implemented their drivers. With Windows 3.1, Microsoft has taken two important steps: It has created a universal driver to help ensure compatibility (see "Pain with No Gain?"), and it has instituted a printer-certification scheme. To find out if your printer and its driver are certified for Windows 3.1, contact Microsoft's technical support at 206-637-7098.—*Robin Raskin*

### 43. CHECK FOR LPT CONTENTION

Windows 3.0 used a driver to prevent two or more applications from "contending for" use of the printer port. Unfortunately, late beta builds of 3.1 from Microsoft did not include that driver. Plans are apparently afoot to make it available separately in the WDL (Windows Driver Library). Meanwhile, the version that came with Windows 3.0 seems to work fine.

If you are upgrading from 3.0 and want to check for contention for LPT1, simply add the line

```
Device=vpd.386
```

to the [386Enh] section of SYSTEM.INI, making sure, of course, that the driver file is present in the Windows subdirectory. You can obtain VPD.386 from CompuServe in either the WINNEW or WINADV forums.—*Craig Stinson*

### 44. TRAP BOOT ERRORS WITH /B

Dr. Watson isn't the only problem-tracking utility in Windows 3.1. If you're having trouble loading 3.1, use the /B switch to help you to track down the culprit.

If Windows hangs during start-up, try loading the program with the command line WIN /B. If Windows hangs again, this will create a file, BOOTLOG.TXT, in the Windows directory that should look something like this:

```
[boot]
LoadStart = SYSTEM.DRV
LoadSuccess = SYSTEM.DRV
LoadStart = KEYBOARD.DRV
LoadSuccess = KEYBOARD.DRV
LoadStart = MOUSE.DRV
LoadSuccess = MOUSE.DRV
LoadStart = VGA.DRV
LoadSuccess = VGA.DRV
LoadStart = MMSOUND.DRV
LoadSuccess = MMSOUND.DRV
LoadStart = COMM.DRV
LoadFail = COMM.DRV Failure code is 02
```

The last line indicates which file failed to load properly. To correct the problem, replace the offending file using EXPAND.EXE (see Tip 5).
—*Christopher Barr* ■

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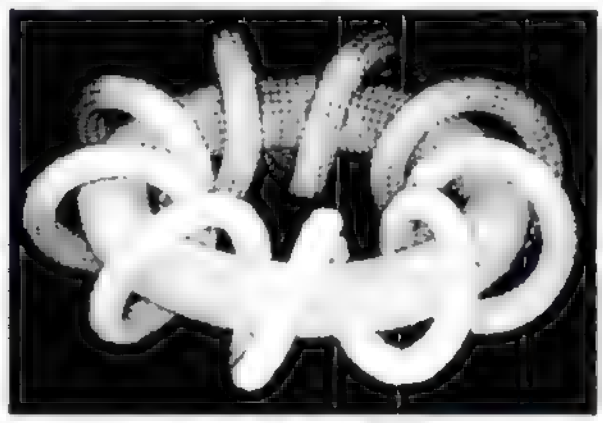

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# OBJECT LINKING AND EMBEDDING: A Survival Guide

**by Michael J. Miller**

The ability to create a *compound document*, a document that contains information from multiple applications, is one of the most powerful concepts in applications software today. Windows 3.1 gives you three ways to combine information from multiple sources: pasting, linking, and embedding.

*Pasting* is the simplest option. You use the standard cut, copy, and paste commands that are part of virtually all Windows applications. You cut or copy information from one application to the Clipboard and then paste it into another application. While this is very simple, the disadvantage is that it places a static, unchangeable copy of the data in your file.

Both *linking* and *embedding* currently use the dynamic data exchange (DDE) protocol that Windows has supported for some time, although that may change in the future. When linking or embedding, you take data from one application, the *server*, and insert it into a file created by another application, the *client*. For instance, *Microsoft Excel* 3.0 could be the server and *Microsoft Word* 2.0 the client, and you could embed an *Excel* graph or spreadsheet in a *Word* document. OLE (object linking and embedding) applications can be clients or servers, or both.

When you link data from one application to another, you are inserting a pointer to the data into your document; the data actually resides in a separate file. The server application (the application that created the data) can be invoked to edit the data in one of two ways: You can start the application in the usual manner, or you can double-click on the data pointer within the client application (the application incorporating the data). Any changes to the data will be automatically reflected in the new file.

Linking is particularly useful if you want to have one piece of data that is common to multiple files—for instance a chart referenced in multiple documents, perhaps over a network. When the chart is changed, all the documents will be automatically updated. The disadvantage is that the information is linked by path and filename, so if the original file is deleted or moved, the link is broken. Also, if you want to share a file with someone else or put it on another machine, you have to include any linked data files from the server applications.

Embedding actually places the data from the server application into the client application file. This lets you put an object, such as a graph or spreadsheet or even another program such as Windows' Calculator (see Windows Tip 16), within a word processing document. Then when you select the object, you can edit it using the tools of the program that created it. Since the embedded data is now part of the new document, that document does not depend on a linked file somewhere else, and it can easily be transferred or copied to another machine. But the unlinked data is also a disadvantage: If the original data is changed, that will not be reflected in your document.

What Windows cannot do yet is to combine the easy maintainability of linked data and the unbreakable tie to the data you get with embedding, a capability promoted by Hewlett-Packard's add-on product *NewWave*.

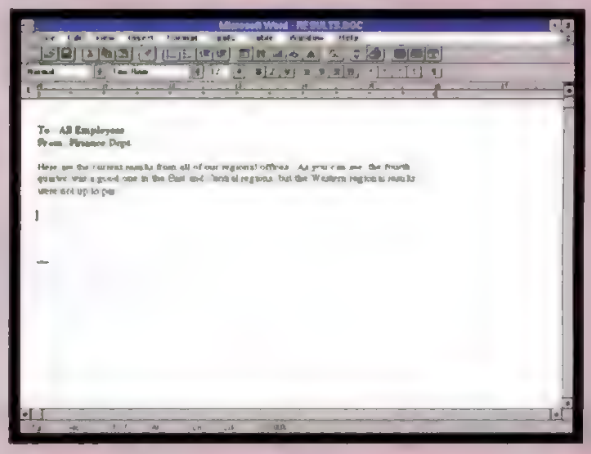
Pasting and linking have been a part of Windows for some time. Windows 3.1 is adding the embedding features through the object linking and embedding specification. The specification is still evolving, and the developers who create applications are still learning the right way to structure them. Still, it's a powerful concept that will affect how we use computers in the future.

Several applications that support OLE have already shipped, including Lotus's *Ami Pro* 2.0, *Microsoft Excel* 3.0, and *Microsoft Word for Windows* 2.0. In addition, Windows 3.1 comes with OLE-enabled versions of the Write, Paintbrush, Cardfile, and Sound Recorder applications. Relatively few applications support the standard, either as a client or a server, as of this time.

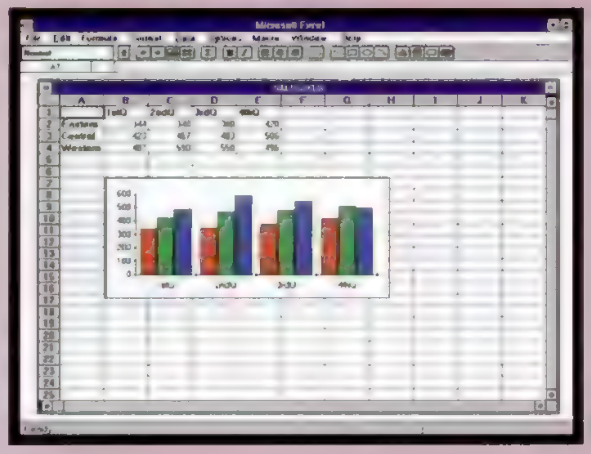
Here's a quick example of how you might use OLE.

## BEFORE YOU BEGIN: START YOUR DOCUMENT AND GATHER YOUR DATA

**For this example, we'll start with a document in *Word* 2.0 (Figure 1) and a spreadsheet and graph in *Excel* 3.0 (Figure 2).**



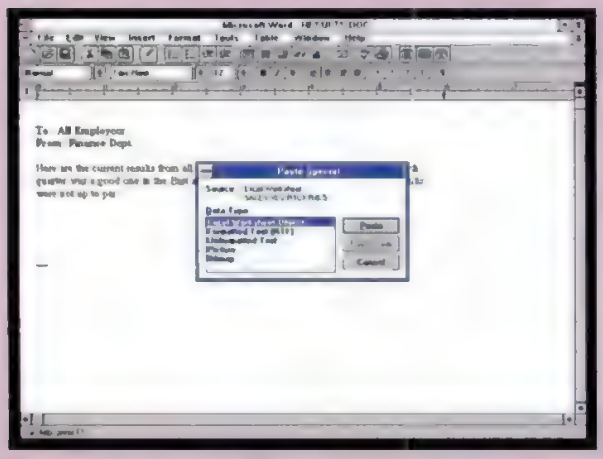
1



2

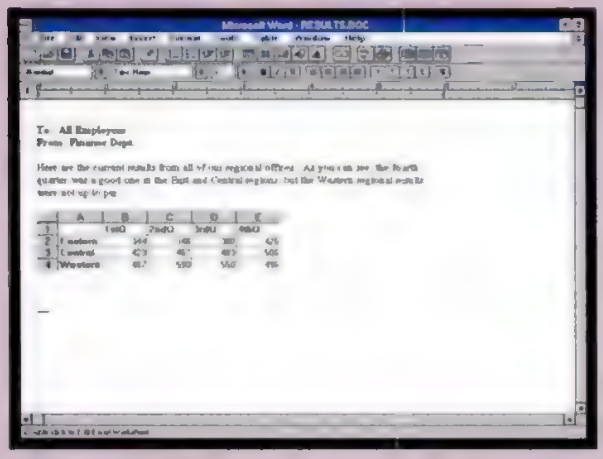
## "PASTE SPECIAL" FOR A WORKSHEET

You could copy the part of the worksheet you want to the Clipboard, then return to *Word* and choose Paste Special and Worksheet Object. This places the part of the worksheet you have selected into your document (Figure 3).



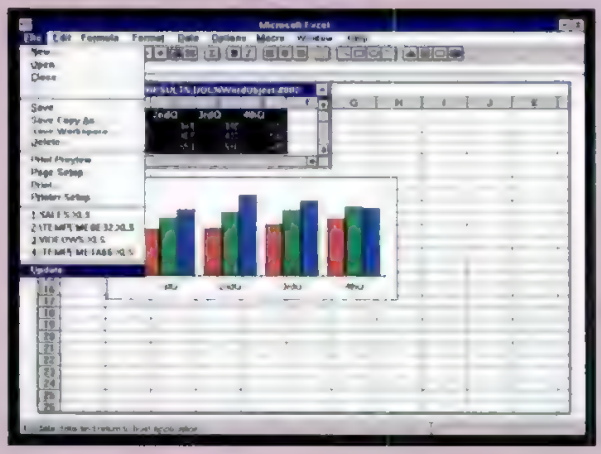
3

Note that your formatting in this case is the formatting from *Excel;* you cannot add further formatting in *Word*. But you can click on the worksheet and return to the *Excel* application.



4

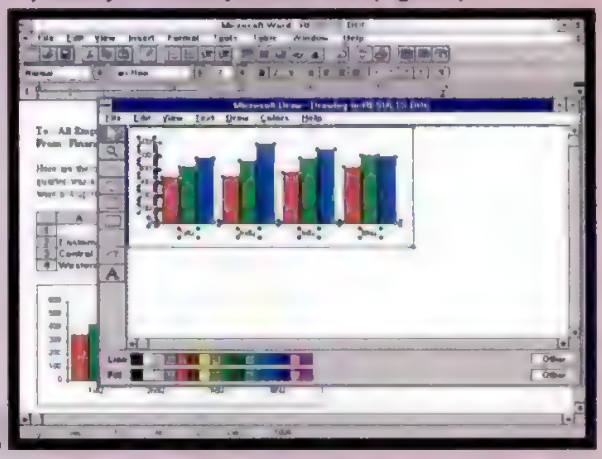
On returning to *Excel*, you can edit your worksheet, then choose Update to bring your changes back into your word processing document (Figure 5).



5

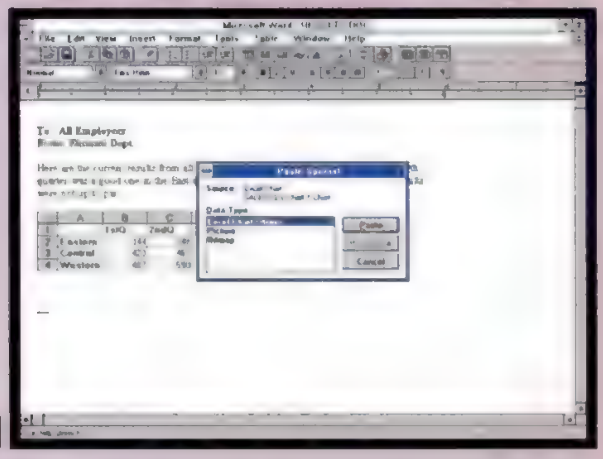
## "PASTE SPECIAL" FOR A CHART

The same actions work if you want to bring in a chart, but it's trickier. If you copy a chart on the *Excel* worksheet (as opposed to in an *Excel* Chart Window), *Word* will only let you paste it as a Picture. Thus, it will look like the display, but if you try to edit it, you will end up in *Word*'s Drawing program, which is probably not where you want to be (Figure 6).



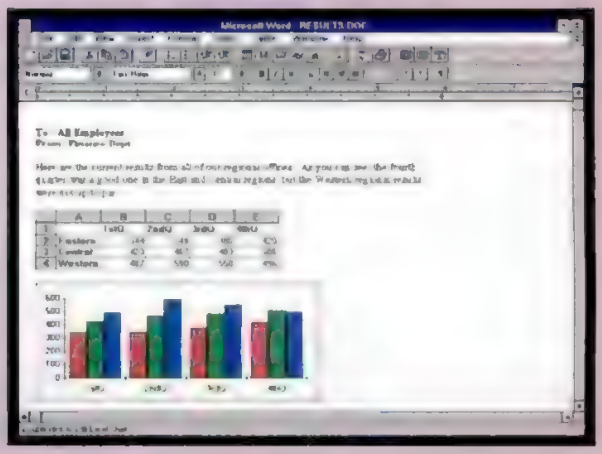
6

Instead, you need to make sure the chart is in a Chart Window (which you can do by double-clicking on a chart on the worksheet), then copy, and paste it in an *Excel* Chart (Figure 7).



7

This places the chart in your document (Figure 8).



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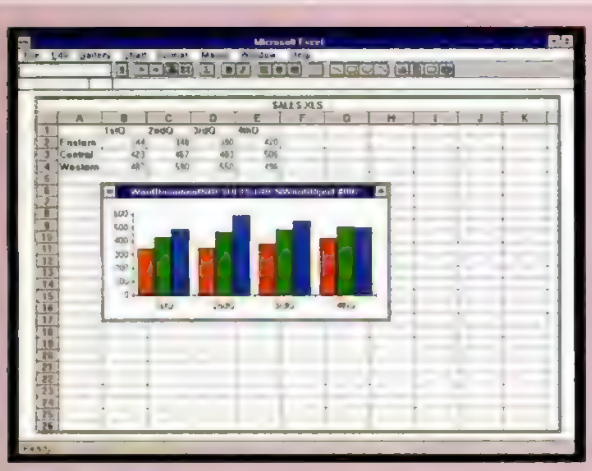
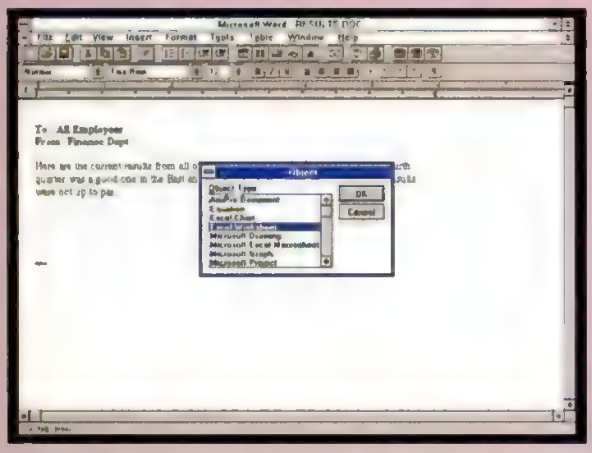


9

Then you can click on a chart and return to *Excel* to edit the worksheet (Figure 9).

## ALTERNATIVE METHOD: INSERT AN OBJECT

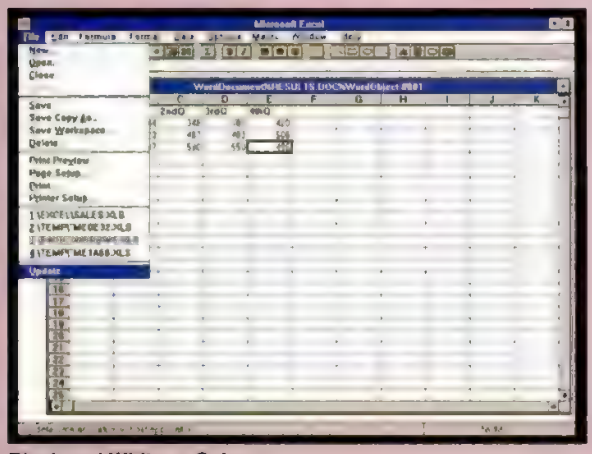
As an alternative, you can insert an object into your document through *Word*'s Insert Object command (Figure 10).



10

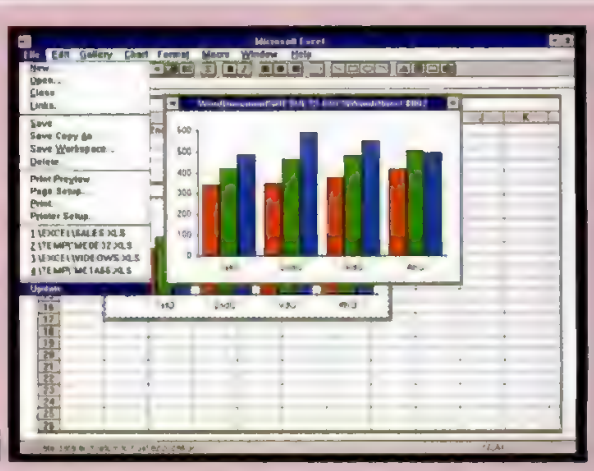
This will bring up a blank spreadsheet within *Excel*. You can then copy data from another worksheet or create it on the spot. Next, you can choose the Update command to place the worksheet into your document (Figure 11).

Similarly, you could do this with a chart (Figure 12). Both the worksheet and the chart could then be edited by double-clicking, which would return the object to *Excel*.



11

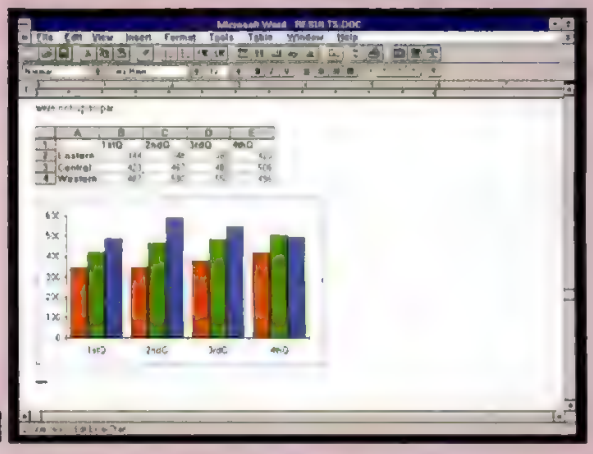
Black and White or Color



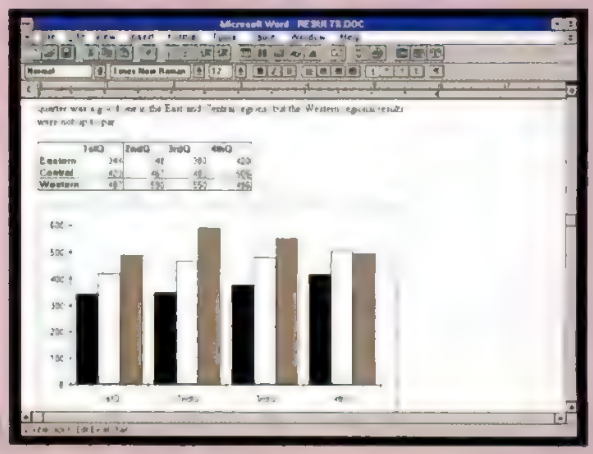
12

One confusing part of the process is discovering which image an OLE object brings with it. When a client application asks a server for an object to insert, it is effectively asking for a metafile image of that object. Most applications (and consequently most servers) store images that are formatted for both the display and the printer you have selected.

The interaction between the client and the server OLE applications (in this case, between the word processor and the spreadsheet) determines which image you'll see in your document. Normally, *Word* displays the printer image, which is in black and white, but if you have no printer installed (or if you have selected "None" as your printer), you'll get the display image in your document (Figure 13). If you have a printer selected, you'll get the printer image (Figure 14).



13



14

Two things to note: When you bring a printer image of a chart from *Excel* into *Word*, you sometimes get a larger image than you were expecting. Also, sometimes when you start with a printer image, then edit the object in *Excel* and return, you can get a display image. Both of these are due to bugs and inconsistencies in the way the applications implement the OLE specification.

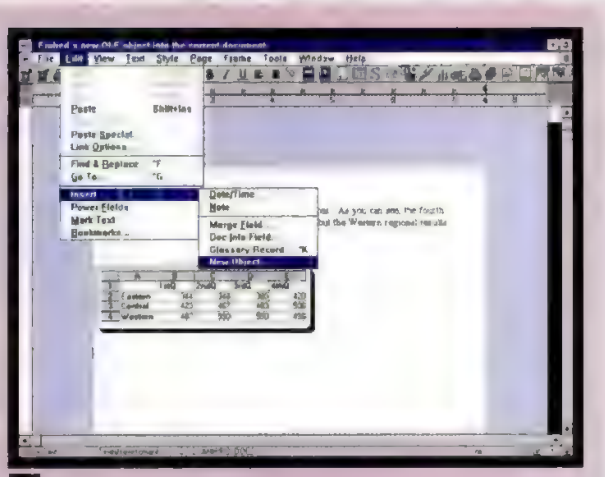
Which do you want, the printer image or the display image? Not surprisingly, the display image looks best on-screen, but the printer version looks best when you print your document. Is either version right? Not really. Ideally, you'd probably like the client to store both the screen and printer versions and use the appropriate one.

## *AMI PRO* AND THE FUTURE OF OLE

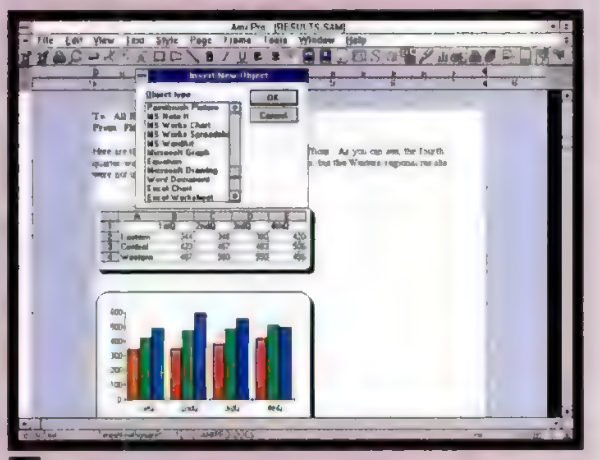
To some extent, the process looks better if you use *Ami Pro* instead of *Word*. In *Ami Pro*, you use the Insert New Object command from the Edit menu, then choose the type of object you want to insert, such as a worksheet (Figure 15) or a chart (Figure 16). Note that *Ami Pro* always brings in the object within a frame, and brings in the screen image of the object.

Is any of this ideal? Hardly. Optimally, you'd prefer not to leave your application at all, but to have the spreadsheet or graphics tools available while you still see your entire document. This could work like the in-line editing features of the drawing module within *Ami Pro*, which brings up a separate toolbar of drawing tools to let you edit an object (Figure 17).

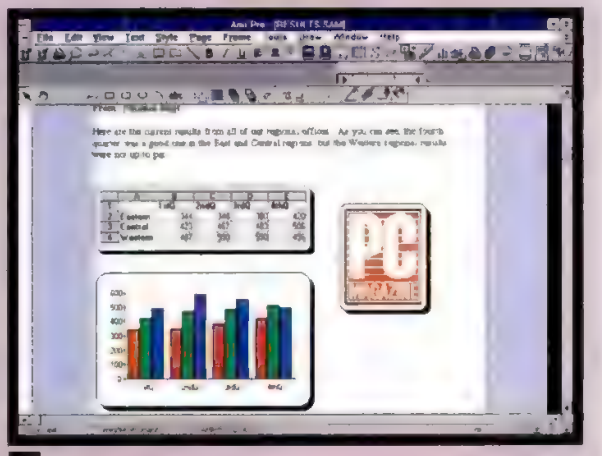
This is one likely direction for future versions of the OLE specification. As you can see, OLE can be very powerful, but it still has a long way to go.



15



16



17



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# The Complete Windows 3.1 Annotated File Listing

An express installation of Microsoft Windows, Version 3.1, may gobble up 11MB of valuable hard disk real estate. Just what does Microsoft do with that much of your disk space? Do you really need all of the files Windows puts on your hard disk? *PC Magazine*'s Complete Windows 3.1 Annotated File Listing will help you answer those two questions.

Our chart lists most of the Windows files you are likely to encounter. It offers a description of each file, tells you whether it is optional or required, and lists any related files. We use an asterisk to indicate those files that are not essential but may be useful in some circumstances—and take up so little space that removing them is more trouble than it's worth.

Besides serving as an interesting overview of the stuff that Windows is made of, our Annotated File Listing should help you customize Windows 3.1 to your needs. And now that you have this information about the Windows files at your fingertips, you can delete any of them from DOS using the Windows Setup program. If you really want a Windows you can travel with, check out our Windows Tip 3: "Lean, Mean Laptop Installation."

Our file list is detailed but not exhaustive. We compiled it using Windows 3.1 on a Compaq 386/25 with a VGA display attached to an HP LaserJet III. We based it on a final beta release of Windows 3.1, so some files and filenames may change when the product ships.

**Windows files are set up in two directories. In each directory, we have listed the essential files first, against a beige background. Within each grouping, files are alphabetized by extension.**

THESE FILES ARE LOCATED IN THE \WINDOWS DIRECTORY:

| FILENAME | DESCRIPTION | ASSOCIATED FILES AND PROGRAMS |
|---|---|---|
| WIN.COM | WIN.COM is loaded before Windows runs to display the logo screen, check the system configurations, and determine what mode Windows will run in. It is created during setup by combining three smaller files. | WIN.CNF; VGALOGO.RLE; VGALOGO.LGO |
| REG.DAT | Data file for the Registration Editor. | REGEDIT.EXE; SETUP.REG |
| CLIPBRD.EXE | Runs the Clipboard Viewer from an icon in the Accessories window. When you are cutting and pasting or copying between Windows applications, the cut or copied information resides temporarily on the Clipboard until it is cleared or something new is cut or copied. | ACCESSOR.GRP; CLIPBRD.HLP |
| CONTROL.EXE | Runs the Control Panel from an icon in the Main window. The Control Panel lets you change the way your system is configured under Windows. You can add or remove fonts, install and configure printers, and make other system adjustments. | MAIN.GRP; CONTROL.HLP; CONTROL.INI; .CPL files; LZEXPAND.DLL |
| EMM386.EXE | Expanded memory manager to provide EMS outside of Windows. | |
| PACKAGER.EXE | Runs a utility from an icon in the Accessories window that creates a package of data or an .EXE file for use in an OLE-client program. | ACCESSOR.GRP; PACKAGER.HLP; OLECLI.DLL |
| PIFEDIT.EXE | Runs the Program Information File editor from an icon in the Accessories window. PIFs tell Windows how to run your DOS applications. You can edit an existing PIF, create a new one, or modify the default PIF. | ACCESSOR.GRP; PIFEDIT.HLP; _DEFAULT.PIF |
| PRINTMAN.EXE | Runs the Print Manager from an icon in the Main window. The Print Manager is a spooler that manages print jobs in the background while you continue to work. | MAIN.GRP; PRINTMAN.HLP |
| PROGMAN.EXE | Runs the Program Manager, which is the central shell from which you launch all of your applications and accessories under Windows. | PROGMAN.HLP; PROGMAN.INI; .GRP files |
| RECORDER.EXE | Runs the macro Recorder from an icon in the Accessories window. The program records keystrokes and mouse actions to be played back from the Recorder's Options menu, or from an assigned shortcut key, to perform routine tasks. | RECORDER.DLL; RECORDER.HLP |
| REGEDIT.EXE | Lets you edit the registration database or add new application descriptions. | REG.DAT; SETUP.REG |
| SETUP.EXE | Runs the Windows Setup program from an icon in the Main window. In Setup you can make changes to your initial system configuration and set up applications to run under Windows. | MAIN.GRP; SETUP.HLP |
| TASKMAN.EXE | Runs the Task Manager. It does not appear as an icon in any window, but pressing Ctrl-Esc displays the Task List, which shows currently running applications and allows you to switch to or close an application. | |
| WINHELP.EXE | Runs the Windows help engine. | All .HLP files |
| WINVER.EXE | Determines the version of Windows installed on the machine. | VER.DLL |
| ACCESSOR.GRP | Data file for the Program Manager's display of the Accessories group. | PROGMAN.EXE |
| APPLICAT.GRP | Data file for the Program Manager's display of the Applications group. | PROGMAN.EXE |
| GAMES.GRP | Data file for the Program Manager's display of the Games group. | PROGMAN.EXE |

* Optional but highly recommended.

| FILENAME | DESCRIPTION | ASSOCIATED FILES AND PROGRAMS |
|---|---|---|
| **VGACOLOR.2GR** | A 286 grabber file specific to the VGA driver. It supports data exchange between DOS and Windows applications while running in Standard mode. | VGA.DRV; WINOLDAP.MOD |
| **VGA.3GR** | A 386 grabber file specific to the VGA driver. It supports data exchange between DOS and Windows applications while running in 386 Enhanced mode. | VGA.DRV; WINOA386.MOD |
| **WIN.CNF** | During setup in our configuration, WIN.CNF combines with VGALOGO.LGO and VGALOGO.RLE to create WIN.COM. As a part of WIN.COM, this file determines the system configuration at boot-up. | VGALOGO.LGO; WIN.COM |
| **CPWIN386.CPL** | Used by Windows to create the 386 Enhanced component of the Control Panel. | CONTROL.EXE |
| **DRIVERS.CPL** | The component of the Control Panel that allows for adding and removing drivers for multimedia under Windows. | CONTROL.EXE |
| **MAIN.CPL** | Contains the basic components of the Control Panel. | CONTROL.EXE |
| **SND.CPL** | The component of the Control Panel that sets particular sound bites for events occurring in Windows. | CONTROL.EXE |
| **LZEXPAND.DLL** | Control Panel uses this library to decompress files from floppy disks during installation. It is the Windows library counterpart of EXPAND.EXE and must come into use when you install new drivers. | CONTROL.EXE; EXPAND.EXE |
| **OLECLI.DLL** | When supporting OLE in Windows applications, Windows uses this library for the client application where the object becomes embedded. | OLESVR.DLL; PACKAGER.EXE |
| **OLESVR.DLL** | Under OLE, this library provides support for the server application where the embedded object resides originally. | OLECLI.DLL |
| **SHELL.DLL** | This library supports the registration database (for drag-and-drop information), drag-and-drop, association functions, and icon extractions. | REG.DAT; REGEDIT.EXE; SETUP.REG |
| **VER.DLL** | Contains the version information for Windows 3.1. | WINVER.EXE |
| **WIN87EM.DLL** | This library is used to emulate floating-point calculations. | |
| **COMM.DRV** | One comm driver is shipped with 3.1. It supports serial and parallel communications. | |
| **VGA.DRV** | VGA graphics driver specified during installation. | VGACOLOR.2GR; VGA.3GR; VGALOGO.LGO; VGALOGO.RLE; VGAFIX.FON; VGAOEM.FON; VGASYS.FON |
| **HPPCL5A.DRV** | HP LaserJet III printer driver, shipped with 3.1 and specified on installation. | HPPCL5A.HLP; HPPCL50P.HLP; FINSTALL.DLL; FINSTALL.HLP; FS5LPT1.PCL |
| **KEYBOARD.DRV** | Standard keyboard driver. Though other drivers are shipped with 3.1, the Standard driver is installed by default. | |
| **MOUSE.DRV** | One of several mouse drivers shipped with 3.1. Specified on installation, it supports a Microsoft or IBM PS/2 mouse. | |
| **SYSTEM.DRV** | Allows access to OEM-defined system hooks and provides information to the system disks. | |
| **TIMER.DRV** | Provides support for the system timer. In 3.0 it was included in the SYSTEM.DRV. | |
| **DOSX.EXE** | DOS extender for Windows, which allows access to extended memory when running in Standard mode. It is executed by WIN.COM and in turn loads KRNL286.EXE. | WIN.COM; KRNL286.EXE |
| **DSWAP.EXE** | Task switcher for DOS applications in Standard mode. | DOSX.EXE |
| **GDI.EXE** | Controls the Graphics Device Interface, which generates the graphics operations required to create displayed images. | USER.EXE |
| **KRNL286.EXE**<br>**KRNL386.EXE** | WIN.COM runs KRNL286.EXE and KRNL386.EXE after it has determined the mode in which Windows will run. KRNL286.EXE loads Windows in Standard mode, KRNL386.EXE in 386 Enhanced mode. | WIN.COM |
| **USER.EXE** | Creates and maintains windows on the display. According to the user's instructions, it creates, sizes, moves, and destroys windows. It also handles movement of icons and cursors and directs input devices to the correct applications. | GDI.EXE |
| **WIN386.EXE** | Executed by WIN.COM to run Windows in 386 Enhanced mode. Provides much of the virtual support needed to run in Enhanced mode. | WIN.COM; KRNL386.EXE |
| **WSWAP.EXE** | Task switcher for Windows applications in Standard mode. | DOSX.EXE; DSWAP.EXE |
| **.FON** | Windows has several kinds of .FON fonts. System, fixed, OEM, and DOS fonts should not be removed. Raster and vector fonts may be removed, depending on your needs. | |
| **CGA40WOA.FON**<br>**CGA80WOA.FON** | Fonts installed by Windows 3.1 for displaying DOS applications when running in 386 Enhanced mode. | DOSAPP.FON |
| **DOSAPP.FON** | Font used when running DOS applications. | CGA40WOA.FON; CGA80WOA.FON; EGA40WOA.FON; EGA80WOA.FON |
| **EGA40WOA.FON**<br>**EGA80WOA.FON** | Fonts installed by Windows 3.1 for displaying DOS applications when running in 386 Enhanced mode. | DOSAPP.FON |
| **VGAFIX.FON** | Specifies the fixed font for a VGA display. It is derived from earlier versions of Windows, which used a fixed-length font as the system font. | VGA.DRV |
| **VGAOEM.FON** | Specifies the terminal (or OEM) font for a VGA display. The terminal font displays OEM text in the Clipboard and provides Windows applications with an OEM character set. | VGA.DRV |
| **VGASYS.FON** | Specifies the system font for a VGA display. It is a proportional-width font used by default to draw menus, dialog boxes, and other text in Windows. | VGA.DRV |
| **FINSTALL.HLP** | The help file for the HP LaserJet soft-font library. It is specific to the printer driver and soft-font DLL installed on your machine under Windows. | FINSTALL.DLL; HPPCL5A.DRV |

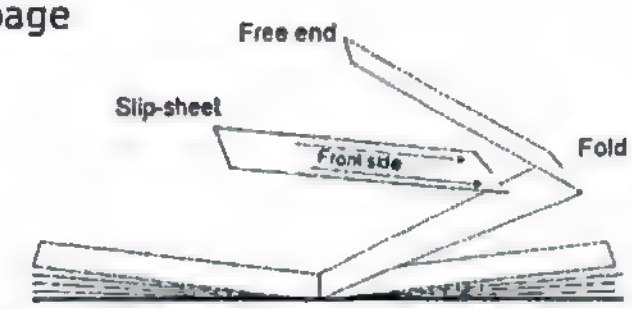
Folded edge of the page

Inverted Foldout slip-sheet

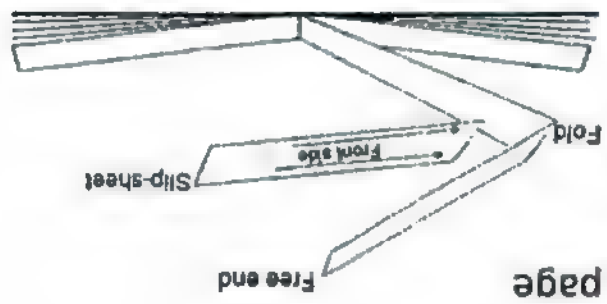
GbsSlipSheet-001

Foldout slip-sheet

1. Open the foldout page
2. Insert this sheet with
   1. Front side touching the free page
   2. Arrow pointing to the fold
3. Slice the folded edge
4. Close the page and slip-sheet

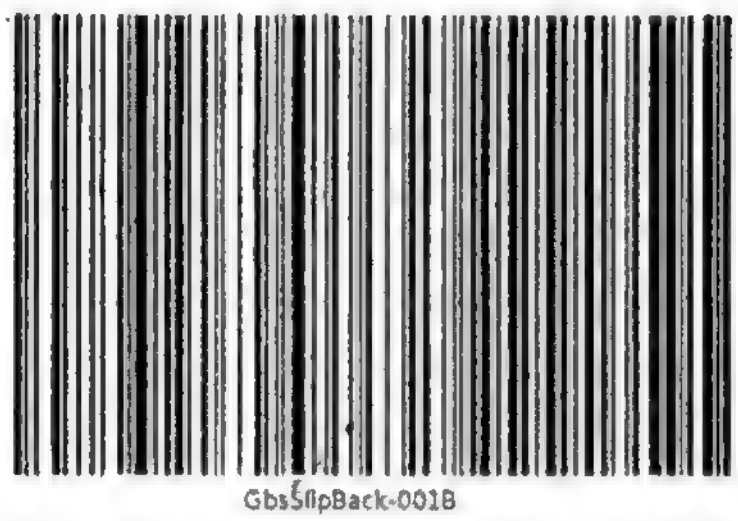



1. Open the foldout page
2. Insert this sheet with
   1. Front side touching the free page
   2. Arrow pointing to the fold
3. Slice the folded edge
4. Close the page and slip-sheet



Inverted Back

1. Follow instructions on the other side




Back

1. Follow instructions on the other side

| FILENAME | DESCRIPTION | FILES AND PROGRAMS |
|---|---|---|
| **MAIN.GRP** | Data file for the Program Manager's display of the Main group. | PROGMAN.EXE |
| **STARTUP.GRP** | Data file for the Program Manager's display of the Startup group. | PROGMAN.EXE |
| **CONTROL.INI** | Initialization file for the Control Panel. Can be edited with the Notepad. | CONTROL.EXE; CONTROL.HLP; NOTEPAD.EXE; .CPL files |
| **MOUSE.INI** | Initialization file for mouse options. | MOUSE.COM; MOUSE.DRV |
| **PROGMAN.INI** | Initialization file for the Program Manager. Can be edited with the Notepad. | PROGMAN.EXE; PROGMAN.HLP; NOTEPAD.EXE; .GRP files |
| **SYSTEM.INI** | Initialization file that records settings like installed drivers and memory settings. It can be edited with SYSEDIT to meet the needs of your hardware configuration. It is like the CONFIG.SYS file in DOS and should be edited with care. | .DRV files, .FON files; SYSEDIT.EXE |
| **WIN.INI** | Windows initialization file that records information about Windows and other applications. It can be edited with SYSEDIT to personalize your Windows environment. It is like the AUTOEXEC.BAT file in DOS. | .EXE files, .WAV files, .FOT files, certain .FON files and .DRV files; SYSEDIT.EXE |
| **FS5LPT1.PCL** | Data file for an HP LaserJet printer (appears only on systems with a compatible printer installed). | HPPCL5A.DRV |
| **_DEFAULT.PIF** | The default Program Information File that Windows uses to run DOS applications that do not have their own PIF. | PIFEDIT.EXE |
| **DOSPRMPT.PIF** | Program Information File that Windows uses to run a DOS session when you double-click on the DOS icon in the Program Manager. | PIFEDIT.EXE |
| **WIN386.SWP** | Temporary swap file where Windows stores data when it runs out of available RAM in 386 Enhanced mode. | Can be set in the Control Panel under the 386 Enhanced icon. |
| **HIMEM.SYS** | Makes extended memory available to Windows by establishing a link between DOS and the high memory area (HMA). | |
| **BOOTLOG.TXT** | Data file created by Setup to track possible problems during Setup; it can also be created by running Windows from the DOS prompt with a /B parameter. Can be viewed with the Notepad. | NOTEPAD.EXE<br>At the DOS prompt, type WIN /B to get a Bootlog. |
| **SETUP.TXT** | Data file with information about Setup. An important file that should be viewed with the Notepad. | NOTEPAD.EXE |
| **.BMP** | Windows 3.1 comes with 22 new bitmap files that create "wallpaper" for your Windows desktop. Any of these files may be removed from your system to free up disk space. Displays only with a 256-color driver. | Select your wallpaper from Desktop icon in the Control Panel. |
| **MOUSE.COM** | The DOS mouse driver. It can be run from DOS, but the driver is not necessary because of the MOUSE.DRV installed by Windows. | MOUSE.INI |
| **WINTUTOR.DAT** | Data file for the Windows tutorial. | WINTUTOR.EXE |
| **MORICONS.DLL** | Dynamic link library with program icons. | |
| **PBRUSH.DLL** | The dynamic link library for the Paintbrush utility. | PBRUSH.EXE; PBRUSH.HLP |
| **RECORDER.DLL** | The dynamic link library for the macro Recorder utility. | RECORDER.EXE |
| **CALC.EXE** | Runs a general and scientific calculator program from an icon in the Accessories window. | ACCESSOR.GRP; CALC.HLP |
| **CALENDAR.EXE** | Runs a desktop calendar and appointment schedule from an icon in the Accessories window. | ACCESSOR.GRP; CALENDAR.HLP |
| **CARDFILE.EXE** | Runs a flat-file database that uses a Rolodex paradigm from an icon in the Accessories window. | ACCESSOR.GRP; CARDFILE.EXE |
| **CHARMAP.EXE** | Runs a utility that displays ANSI high-order characters from an icon in the Accessories window. | ACCESSOR.GRP |
| **CLOCK.EXE** | Runs an analog or digital clock from an icon in the Accessories window. Time can be set from the Control Panel, which is in the Main window. | ACCESSOR.GRP; DIGITAL.GRP |
| **DRWATSON.EXE*** | In Version 3.0, Dr. Watson was available only through downloading. Included in 3.1, Dr. Watson is a diagnostic tool for obtaining information when a General Protection (GP) fault occurs. Dr. Watson must be running when a GP fault occurs. To make it run when you start Windows, drag it to the Startup group; used with MSD, it provides a complete picture of your system for Microsoft technicians when a GP fault occurs. | DRWATSON.LOG |
| **MPLAYER.EXE** | Runs the Media Player, a utility for playing MIDI audio files, from an icon in the Accessories window. | ACCESSOR.GRP; MPLAYER.HLP; CANYON.MID; PASSPORT.MID MMTASK.TSK |
| **MSD.EXE*** | In 3.0, the Microsoft Diagnostics (MSD) utility had to be downloaded. Included in 3.1, MSD helps identify system configurations. It can be used with Dr. Watson to give Microsoft technicians an idea of your system setup at the time of a GP fault. | DRWATSON.EXE; USD.INI |
| **NOTEPAD.EXE** | Runs the Notepad from an icon in the Accessories window. The Notepad is a text editor you can use for jotting down notes, writing memos, or editing batch files. | ACCESSOR.GRP; NOTEPAD.HLP |
| **PBRUSH.EXE** | Runs the Paintbrush program from an icon in the Accessories window. The Paintbrush can be used to create bitmap drawings. | ACCESSOR.GRP; PBRUSH.DLL; PBRUSH.HLP |
| **SOL.EXE** | Runs Solitaire from an icon in the Games window. | GAMES.GRP; SOL.HLP |
| **SOUNDREC.EXE** | Plays and edits audio .WAV files from an icon in the Accessories window if a sound driver is properly installed. | ACCESSOR.GRP; CHIMES.WAV; CHORD.WAV; DING.WAV; TADA.WAV |
| **SMARTDRV.EXE*** | Runs the SMARTDrive disk cache program included in Windows 3.1. Setup installs this automatically, but it can be removed if you chose to use a third-party disk cache. In Win 3.0, SMARTDrive was loaded in CONFIG.SYS. In Win 3.1, it is loaded with a command in your AUTOEXEC.BAT file. | |
| **TERMINAL.EXE** | Runs the Terminal program from an icon in the Accessories window. The Terminal is a desktop communications manager for connecting to remote computers and on-line services. | ACCESSOR.GRP; TERMINAL.HLP |

| FILENAME | DESCRIPTION | ASSOCIATED FILES AND PROGRAMS |
|---|---|---|
| **WINFILE.EXE** | Runs the File Manager from an icon in the Main window. The program acts as a shell in which you can organize your files and directories in directory trees. | MAIN.GRP; WINFILE.HLP; WINFILE.INI |
| **WINMINE.EXE** | Runs the game Minesweeper—which is included with Win 3.1—from an icon in the Games window. | GAMES.GRP; WINMINE.HLP |
| **WINTUTOR.EXE** | Runs the Windows tutorial. | WINTUTOR.DAT |
| **WRITE.EXE*** | Runs the Write program from an icon in the Accessories window. Microsoft Windows Write is an entry-level word processing application for creating and printing documents. | WRITE.HLP; all .WRI files (necessary to read .WRI help files) |
| **CALC.HLP** | The Calculator help file. | CALC.EXE |
| **CALENDAR.HLP** | The Calendar help file. | CALENDAR.EXE |
| **CARDFILE.HLP** | The Cardfile help file. | CARDFILE.EXE |
| **CHARMAP.HLP** | The Character Map help file. | CHARMAP.EXE |
| **CLIPBRD.HLP** | The Clipboard help file. | CLIPBRD.EXE |
| **CONTROL.HLP** | The Control Panel help file. | CONTROL.EXE |
| **GLOSSARY.HLP** | Data file with the Help system's glossary. | WINHELP.HLP |
| **MPLAYER.HLP** | The Media Player help file. | MPLAYER.EXE |
| **NOTEPAD.HLP** | The Notepad help file. | NOTEPAD.EXE |
| **PACKAGER.HLP** | The Object Packager help file. | PACKAGER.EXE |
| **PBRUSH.HLP** | The Paintbrush help file. | PBRUSH.DLL; PBRUSH.EXE |
| **PIFEDIT.HLP** | The PIF Editor help file. | PIFEDIT.EXE |
| **PRINTMAN.EXE** | The Print Manager help file. | PRINTMAN.EXE |
| **PROGMAN.HLP** | The Program Manager help file. | PROGMAN.EXE |
| **RECORDER.HLP** | The macro Recorder help file. | RECORDER.EXE |
| **REGEDIT.HLP** | The Registration Editor help file. | REGEDIT.EXE |
| **SETUP.HLP** | The Windows Setup help file. | SETUP.EXE |
| **SOL.HLP** | The Solitaire help file. | SOL.EXE |
| **SOUNDREC.HLP** | The Sound Recorder help file. | SOUNDREC.EXE |
| **TERMINAL.HLP** | The Terminal communications manager help file. | TERMINAL.EXE |
| **WINFILE.HLP** | The File Manager help file. | WINFILE.EXE |
| **WINHELP.HLP** | The "how to use help" data file. | WINHELP.EXE |
| **WINMINE.HLP** | The Minesweeper help file. | WINMINE.EXE |
| **WRITE.HLP** | The Write help file. | WRITE.EXE |
| **MPLAYER.INI** | Initialization file with Media Player settings. | MPLAYER.EXE; MPLAYER.HLP; .MID files |
| **MSD.INI*** | Initialization file for Microsoft Diagnostics. | MSD.EXE; MSD.HLP |
| **DRWATSON.LOG*** | Data file for Dr. Watson, the diagnostic utility. | DRWATSON.EXE |
| **.MID** | Two MIDI audio files. | MPLAYER.EXE |
| **SSFLYWIN.SCR** | Data file for the Windows logo screen saver. Screen savers are chosen from the Desktop icon in the Control Panel. | CONTROL.EXE |
| **SSMARQUE.SCR** | Data file for the marquee screen saver. | CONTROL.EXE |
| **SSMYST.SCR** | Data file for the mysterious screen saver. | CONTROL.EXE |
| **SSSTARS.SCR** | Data file for the star field screen saver. | CONTROL.EXE |
| **RAMDRIVE.SYS** | The RAMDrive utility simulates a disk drive in memory for faster access to information. | |
| **.WAV** | Four separate audio files that can be played by Sound Recorder if a sound driver is installed. | SOUNDREC.EXE |
| **NETWORKS.WRI** | Readme file containing information on network support. Can be viewed with Write. | WRITE.EXE |
| **PRINTERS.WRI** | Readme file containing general information on printer support that became available after the manual was printed. Can be viewed with Write. | WRITE.EXE |
| **README.WRI*** | Readme file containing general information on Windows 3.1 that became available after the manual was printed. Can be viewed with Write. | WRITE.EXE |
| **SYSINI.WRI*** | Readme file with information on the SYSTEM.INI file. Can be viewed with Write. | SYSTEM.INI; WRITE.EXE |
| **WININI.WRI*** | Readme file for use with the WIN.INI file in managing switches. Can be viewed with Write. | WIN.INI; WRITE.EXE |

**THESE FILES ARE LOCATED IN THE \WINDOWS\SYSTEM DIRECTORY:**

| FILENAME | DESCRIPTION | ASSOCIATED FILES AND PROGRAMS |
|---|---|---|
| **VDDAVGA.386** | A driver file for Super VGA graphics in 386 Enhanced mode. | |
| **VTDAPI.386** | A driver file for 386 Enhanced mode. | |

* Optional but highly recommended.

# Attention All dBASE Users: Your Windows Have Arrived.

Introducing new dBFast.™ The first and only dBASE™ compatible database and dBASE/X-Base language for Windows. It's the fastest, smartest and easiest way for millions of users and developers to join the Windows revolution.

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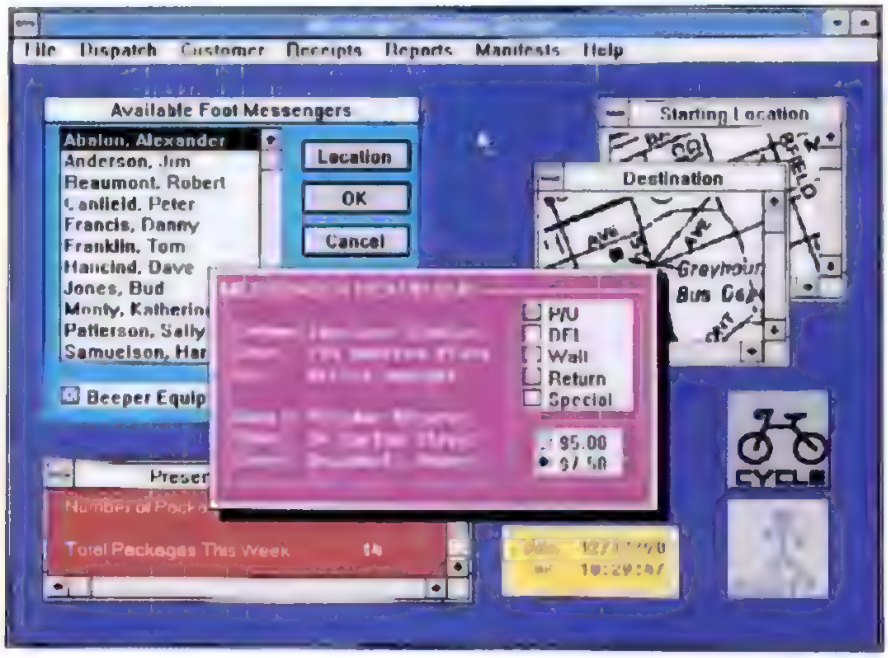


*dBFast helps you create powerful, graphical database applications quickly and easily with pull-down menus, check boxes, radio buttons and even bitmap images.*

Unlike other Windows development systems that force you to learn a new language, dBFast allows dBASE, Fox and Clipper developers to use the language they already know with more than 200 extensions and an interactive editor, compiler and linker.

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CIRCLE 381 ON READER SERVICE CARD

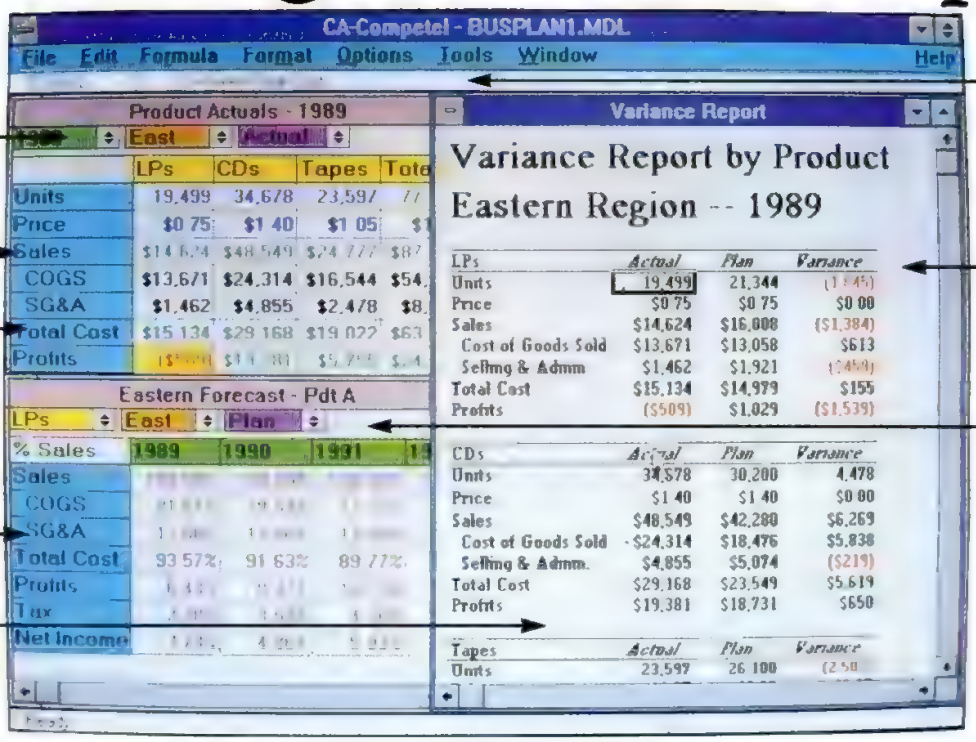
# What Comes After Spreadsheets? Introducing New CA-Compete!

*Up to 12 different dimensions you can navigate through with the click of a mouse.*

*Use simple English—no column or row references needed.*

*Name and save multiple views. Look at up to 12 at a time.*

*Extra sheets available for custom reports and additional calculations.*




*Global formulas you can apply to a range of cells.*

*Presentation-quality output with fonts, borders, and shades.*

*Looks like a spreadsheet with standard commands you know, like cut, paste, copy, and annotate.*

*Chosen "Best of 1990" by PC Magazine.**

Welcome to the world of multi-dimensional modeling & viewing.

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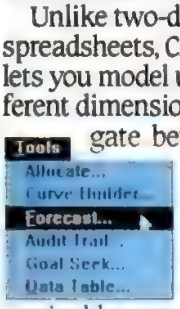
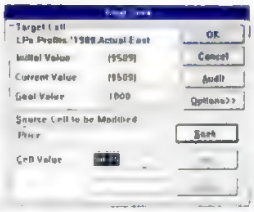
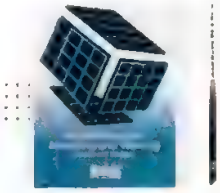




You can also trace the origin of any value with a quick, graphical Audit Trail Tool.

CA-Compete! reads and writes Lotus® 1-2-3,® Excel, dBase,® ASCII and Script Files so you can work with all of your current files.



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CIRCLE 348 ON READER SERVICE CARD

GbsSlipBack-001B

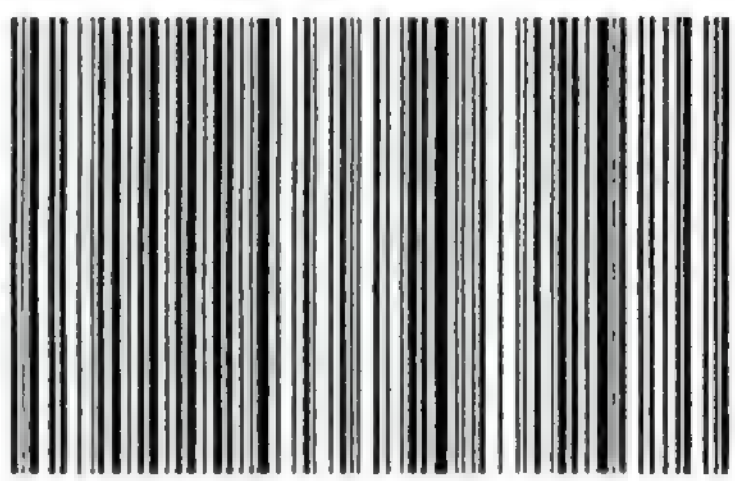
## Back

1. Follow instructions on the other side

## Inverted Back

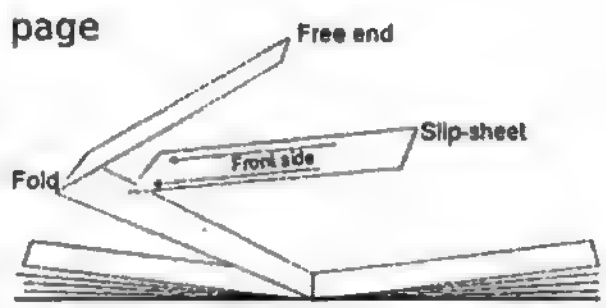
1. Follow instructions on the other side

Folded edge of the page



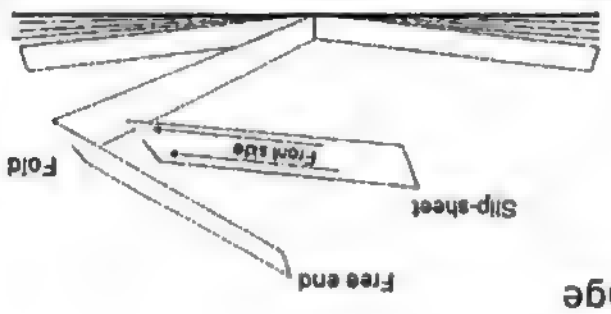

Inverted Foldout slip-sheet

1. Open the foldout page
2. Insert this sheet with
   1. Front side touching the free page
   2. Arrow pointing to the fold
3. Slice the folded edge
4. Close the page and slip-sheet




Foldout slip-sheet

1. Open the foldout page
2. Insert this sheet with
   1. Front side touching the free page
   2. Arrow pointing to the fold
3. Slice the folded edge
4. Close the page and slip-sheet



| FILENAME | DESCRIPTION | ASSOCIATED FILES AND PROGRAMS |
|---|---|---|
| HPPCL5A.HLP | The help file for the HP LaserJet III printer driver, which was specified during installation. | HPPCL5A.DRV |
| HPPCL50P.HLP | Additional help file for the HP LaserJet III. | HPPCL5A.DRV; HPPCL5A.HLP |
| APPS.INF | A data file for Setup that is used to create the PIFs for DOS programs on your hard disk. | SETUP.EXE |
| CONTROL.INF | A data file for Setup that is used to create the initial Control Panel setting. | SETUP.EXE; .DRV files |
| SETUP.INF | A data file used by Setup to install Windows on your machine. It provides configuration options, related files, and groups that Program Manager sets up like Accessories and Applications. | SETUP.EXE; SETUP.HLP |
| MOUSE.INI | A data file used to initialize the mouse settings. | |
| VGALOGO.LGO | WIN.COM runs the LGO file, which contains code for displaying the opening screen. VGALOGO.LGO is specified during setup to work on a VGA display. | VGA.DRV; WIN.COM; WIN.CNF |
| WINOA386.MOD | Supports data exchange between DOS and Windows applications when running in 386 Enhanced mode. | |
| WINOLDAP.MOD | Supports data exchange between DOS and Windows applications when running in Standard mode. | VGACOLOR.2GR |
| VGALOGO.RLE | WIN.COM runs the RLE (run length encoded) file, which contains the actual logo bitmap for the opening screen. VGALOGO.RLE is specified during setup to work on a VGA display. | VGA.DRV; WIN.COM; WIN.CNF; VGALOGO.LGO |
| MIDIMAP.CFG | A configuration file for playing audio files; needed only if a sound driver is installed. | |
| COMMDLG.DLL | A dynamic link library that contains common dialog boxes, which programmers can use to create their own custom boxes for opening files, printing documents, or other common tasks. (Keep for programming.) | |
| DDEML.DLL | The Dynamic Data Exchange Management Library. Built on top of the old message-based DDE, DDEML can make coding easier. It is available only in protected mode. (Keep for DDE coding.) | |
| FINSTALL.DLL | Soft-font library installer for the HP LaserJet that was specified on installation Additional font libraries are included to run with corresponding printer drivers. Not every driver has a soft-font library. | FINSTALL.HLP; HPPCL5A.DRV |
| MMSYSTEM.DLL | Dynamic link library for playing audio files if a sound driver is installed. | |
| TOOLHELP.DLL | A dynamic link library that gives programmers information on the internal data in Windows to aid in debugging. (Keep for programming.) | |
| MCISEQ.DRV<br>MCIWAVE.DRV<br>MIDIMAP.DRV<br>MMSOUND.DRV | Drivers for playing audio sound when a sound driver is installed. | MPLAYER.EXE; SOUNDREC.EXE; .MID files; .WAV files |
| SYSEDIT.EXE* | A utility for editing CONFIG.SYS, AUTOEXEC.BAT, WIN.INI, and SYSTEM.INI files. | SYSTEM.INI; WIN.INI |
| .FON | Windows has several kinds of .FON fonts. System, fixed, OEM, and DOS fonts should not be removed. Raster and vector fonts may be removed, depending on your needs. | |
| COURE.FON | Specifies a Courier raster font. The E on the end of the filename specifies a VGA display. It is a fixed-width font with serifs and is provided to emulate a printer font on-screen. | |
| MODERN.FON | Specifies a Modern vector font; one of the earlier scalable Windows fonts that have been superceded by TrueType fonts. | |
| ROMAN.FON | Specifies a Roman vector font (see MODERN.FON). | |
| SCRIPT.FON | Specifies a Script vector font (see MODERN.FON). | |
| SERIFE.FON | Specifies a Times-like bitmapped font for a VGA display. It is a proportional-width font with serifs and is used to emulate a printer font on-screen. | |
| SMALLE.FON | Specifies small (2- through 7-point) sans serif fonts for a VGA display. | |
| SSERIFE.FON | Specifies a Helvetica raster font for a VGA display. It is a proportional-width font without serifs, used to emulate a printer font on-screen. | |
| SYMBOLE.FON | Specifies a Symbol bitmapped font for a VGA display. It is provided to emulate printer fonts on-screen. | |
| .FOT | .FOT files are the metric files for the scalable outline fonts. There are 13 stylistic variations of four typefaces. You may choose to keep only what you use. You will need both the .FOT file and the .TTF file for the font to function properly. Note that Arial replaces Helvetica in 3.1. | .TTF files |
| WIN386.PS2 | Special file for running Windows on PS/2 machines. | |
| SETUP.REG | Used by Setup to register applications shipped with Windows for drag-and-drop support. Can be deleted after setup. | REG.DAT; REG.EXE |
| MMTASK.TSK | Used for multimedia sound. | |
| .TTF | .TTF files are the header files for the scalable outline fonts. There are 13 stylistic variations of four typefaces. You may choose to keep only what you use. You will need both the .TTF file and the .FOT file for a font to function properly. | .FOT files |

* Optional but highly recommended.

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## *The #1 Rated Project Manager Now Available For Windows.*

Power changes people.

Especially project managers.

They're working smarter and faster with new CA-SuperProject® For Windows.

It's the world's most advanced, efficient and reliable project management software – and now it's incredibly easy to use.

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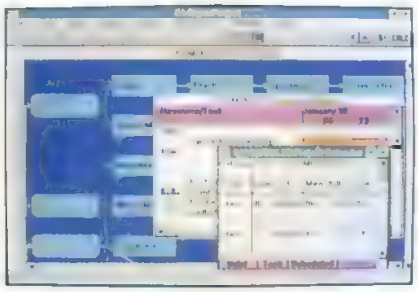
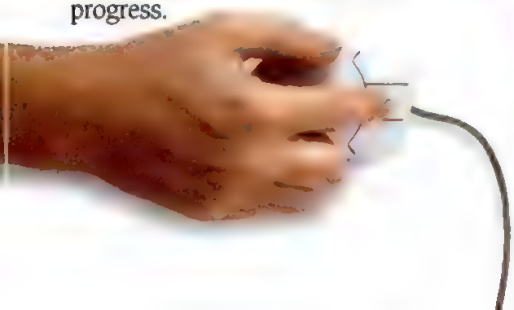
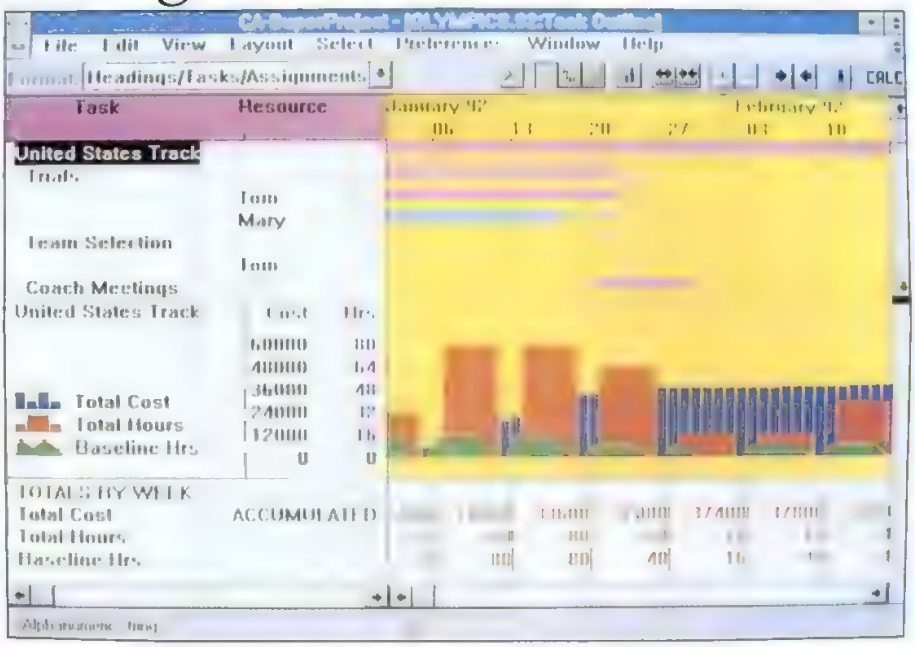


*Report the status of your project with detailed Gantt, PERT, WBS and Cost/Resource charts.*

dependency relations. Link multiple projects together for cross-project leveling. Perform extensive "what-if" analysis, revising schedules as projects progress.






*Manage with power, using tools for sophisticated planning, comprehensive resource management, tracking and controlling.*

You can bet your career on its advanced and efficient scheduling algorithms.

A recent study of the five leading project managers proved it. Each was

*Show multiple views of the same project or different projects simultaneously.*

assigned the same project, but the finish dates varied by as much as five months. CA-SuperProject For Windows finished first in 214 working days–leaving Microsoft Project, Timeline 4.0, Project Workbench and Project Scheduler in the dust.

There's also a wide array of state-of-the-art graphics and detailed reporting tools to help bring your projects to life.

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CIRCLE 084 ON READER SERVICE CARD

# Gain with No Pain?

## Driver and utility vendors are more than ready for 3.1

by Lance Ulanoff

On the surface, Microsoft Windows 3.1 looks much like its predecessor, but as always, what's beneath the surface is what really counts. Thanks to its more streamlined code, Windows 3.1 is faster and smarter than 3.0.

With so much power and change rumbling under the surface, it's only natural that some of the changes might have affected backward compatibility, especially with Windows-specific utilities and device drivers. Inevitably, this raises the question: Are my current device drivers, type managers, and memory managers compatible with Windows 3.1?

Those of you who remember the migration from Windows 2.x to 3.0 will recall that locating 3.0 driver upgrades was like searching for needles in a haystack. Luckily, Microsoft and the supporting vendors are much better prepared this time around. *PC Magazine* surveyed nearly 100 vendors and found that the 3.1 news is largely good. Most major VGA, printer, memory and font management, disk caching, and utility software packages are already compatible with Windows 3.1. Does this mean that they all fully utilize each new 3.1 feature? Not really. It means your system won't crash and the printer should readily interface with your PC, but you may not immediately have access to some of Version 3.1's enhancements.

### PICTURE THIS

Most VGA drivers work with Windows 3.1, even without being upgraded. But they may not be able to take advantage of Windows 3.1's enhanced capabilities such as increased display speed. Several VGA driver vendors say that current driver versions need upgraded setup modules for effective installation.

### PRINTING POSSIBILITIES

Microsoft bundles a long list of printer drivers with its Windows system software. The big news in printer drivers for Windows, however, is Windows 3.1's new universal printer driver, UNIDRV. Though transparent to the user, this single, printer-independent driver serves as the framework for driving almost any printer. Microsoft has used this technology, along with parameter tables ("mini-drivers") supplied by printer manufacturers, to build reliable 3.1 drivers for an impressive list of printers.

You still choose an individual printer in Setup, but in fact you're accessing UNIDRV indirectly. Microsoft says that since the universal driver acts as the mother driver for a host of printers, any changes or enhancements made to it will be reflected in the enhanced abilities of individual printer drivers (provided the printer has the capabilities). Printer-specific upgrades may also be available directly to the users, often via bulletin boards.

More good news on the printing and display front comes from type management vendors. Most, like Adobe Systems, point out that their font software is fully compatible with Windows 3.1 and its new TrueType technology. But there are exceptions. Bitstream, for example, has released a new version of *FaceLift for Windows*.

## COMPATIBILITY CHART

■—Yes ⌟—No

| Company | Current version compatible with Windows 3.1 | Upgrades available | Upgrades shipping with Win 3.1 | Available via download | Telephone numbers (M=main, TS=technical support) | Comments |
|---|---|---|---|---|---|---|
| **MOUSE DRIVER** | | | | | | |
| Microsoft Corp. Microsoft Mouse Driver, Version 8.1 | ■ | ⌟ | ■ | ⌟ | 800-426-9400 | Mouse Driver, Version 8.1, is free to 8.0 owners and $25 for those with previous mouse versions. Earlier versions are also compatible with Win 3.1. |
| **PRINTER DRIVERS** | | | | | | |
| Canon USA Inc. | ■ | ■ | ■ | ■ (BBS #. 516-488-6528) | 516-488-6700 (M), 800-423-2366 (TS) | BubbleJet 10e, 130e, 300, and 330, LBP-8III, and LPB-4 are included in Win 3.1. |
| Citizen America Corp. | ⌟ | ■ | ■ | ⌟ | 310-453-0614 | Citizen's standard drivers, 120D, 180D, 200GX, 200GX/15, GSX- 130, 140, 140+, and 145, HSP- 500 and 550, and PN4 are all supported in Win 3.1. A professional-level driver is also available from the printer manufacturer. |
| Digital Equipment Corp. Video, Image and Print Systems Group | ■ | ■ | ■ | ■ (CompuServe forum: DECPCI, file: DEC WPD) | 800-344-4825 (M), 508-635-8293 (TS) | Upgraded printer drivers for PostScript laser printers (including printer servers), DEClaser 1150, 2150, 2250, and 3250, LN03R ScriptPrinter, Turbo PrintServer 20, PrintServer 20 Plus and 40 Plus, and Colormate PS, are bundled with Win 3.1. Drivers for remaining laser printers (DEClaser 1100, 2100, 2200, and 3200), dot matrix printers (LA70, 75, 75 Plus, and 324), and ink jet printers (DECjet 1000, 2000, and LJ250/252), are from DEC and Microsoft's Driver Library. |
| Eastman Kodak Co. | ■ | ■ | ⌟ | ⌟ | 800-244-2424 (M), 800-344-0006 (TS) | Drivers for the Ektaplus, Diconix, and thermal printers (XL7700, S6600, and P6600) are available from Kodak. |

An asterisk in any column indicates a footnote in the "Comments" column.

CONTINUES

### IS SMARTER BETTER?

With SMARTDRV, Version 4.0, the battle between Microsoft Windows' proprietary disk cache and independent disk caches continues. Beta testers and Microsoft report that the revamped SMARTDRV program (now an executable file and no longer a device driver) outperforms all caches on the market and should replace them. On the other hand, The Aldridge Co., for example, maintains that its disk-caching utility, *Cache86*, is smaller and faster than SMARTDRV.

A look at the chart should comfort most users because, in the end, the issue is less one of compatibility than "ability to perform." For the most part, existing device drivers and background software perform well in the Windows 3.1 environment.

Note: This chart was compiled in late December 1991 and January 1992, just prior to the release of Microsoft Windows 3.1. As a result, many vendors' compatibility assessments were based on a final beta version of the operating software. Although this version closely resembles the now-released edition of Version 3.1, there may be some minute changes that could affect compatibility.

Our advice: Take a long hard look at this chart; it will be time well spent, because you'll learn something about our industry's increased sophistication at handling major and minor changes. But realistically, you should understand that the most valuable piece of information found here may well be the technical assistance number.

### KEY TO THE CHART

A company name in a given product class is listed once in the first column, and followed by associated drivers and software products. In the second column, "Current version compatible with Windows 3.1," vendors have indicated whether the device driver or product currently on the market works with Windows 3.1. In some cases, even though the software works with Windows, a minor upgrade, such as a revamped setup procedure, may be necessary.

The third column in the chart indicates the availability of upgrades, if any. The fourth column, "Upgrade shipping with Windows 3.1," shows whether or not the software is bundled in Windows 3.1's shrink-wrapped package. The fifth column, "Available via download," reveals whether the software may be downloaded from bulletin boards or CompuServe.

In the sixth column, the main and technical-support telephone numbers are noted. This is followed by the final "comments" column, which includes technical specifications, special information about upgrades, and comments on backward compatibility with previous software versions. ■

## COMPATIBILITY CHART

| ■—Yes ⌟—No<br>Company | Current version compatible with Windows 3.1 | Upgrade available | Upgrade shipping with Win 3.1 | Available via download | Telephone numbers (M=main, TS=technical support) | Comments |
|---|---|---|---|---|---|---|
| **PRINTER DRIVERS (continued)** | | | | | | |
| Epson America Inc. | ■ | ■ | ■ | ⌟ | 800-922-8911 | Epson printers supported by Win 3.1 include DFX-5000, EPL-6000, -7000, -7500, EX-800, -1000, FX-80, -80+, -85, -86e, -100, -100+, -185, -286, -286e, -850, -1050, GQ-3500, JX-80, L-750, -1000, LQ-500, -570, -800, -850, -870, -950, -1000, -1050, -1070, LQ-1170, -1500, -2500, -2550, LX-80, -86, -800, -810, MX-80, -80 F/T, -100, RX-80, -80 F/T, -80 F/T+, -100, -100+, SQ-2000, -2500, and T-750 and -1000. Windows 3.1 will support Epson's ESC/P2 printer control language, which includes support for a compressed raster graphics mode and provides high-quality output of scalable TrueType fonts. |
| Hewlett-Packard Co. | ■ | ■ | ■ | ⌟ | 800-752-0900 (M), 208-323-2551 (TS) | Upgraded Hewlett-Packard drivers for its DeskJet, DeskJet 500, DeskJet Plus, LaserJet, LaserJet PostScript, DraftPro, DraftMaster, ThinkJet, ColorPro, and 7400 and 7500 series. PaintJet and PaintJet XL printers are bundled with Win 3.1. The DeskJet 500C printer ships with a Win 3.1-compatible driver. Upgraded drivers for the HP QuietJet will be available on Microsoft's Driver Library, which will ship after Win 3.1. |
| Lexmark International Inc. | ■ | ■ | ■ | ■ (BBS # 606-232-5653) | 800-426-2468 | All Lexmark printer drivers will be included in the Win. 3.1 package, with the exception of IBM LaserPrinter 4029 (PPDS mode), Personal Printer Series II 2380/81 and 2390/91, and Proprinter 24P 4212. These are available from Lexmark's tech support line. |
| Mannesmann Tally Corp. | Emulations only | ⌟ | ⌟ | ⌟ | 206-251-5500 (M), 206-251-5593 (TS) | Mannesmann Tally printer drivers are included in the international version of Microsoft Windows 3.1. Within the U.S., Mannesmann relies on major printer emulations such as Epson, IBM, and Hewlett-Packard |

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CIRCLE 280 ON READER SERVICE CARD

## COMPATIBILITY CHART

| ■ Yes ❑ No<br>Company | Current version compatible with Windows 3.1 | Upgrade available | Upgrade shipping with Win 3.1 | Available via download | Telephone numbers (M=main, TS=technical support) | Comments |
|---|---|---|---|---|---|---|
| **PRINTER DRIVERS (continued)** | | | | | | |
| NEC Technologies Inc. | ■ | ■ | ■ | ■ (BBS #: 508-635-6328) | 508-264-8000 (M), 800-388-8888 (TS) | NEC upgraded drivers bundled with Win 3.1 include Silentwriter2, Models 90, 990, 290, LC890, and LC890XL, Colormate PS/40 and 80. Pinwriters P6/P7, CP6/CP7, P5200/P5300, P9XL, P5XL, and P2200 are supported in 3.1. Support for the new Silentwriter 95 is added by installing the Windows PostScript Description (WPD) file included with the printer. Minidrivers for Pinwriters P2200XE, P3200, P3300, P6200, P6300, and P9300 are available from NEC and Microsoft on CompuServe, GENie, and Microsoft's PSS (BBS #: 206-637-9009). |
| Okidata Corp. | ■ | ■ | ■ | ■ (BBS #: 800-654-3282) | 609-235-2600 (M), 800-654-3282 (TS) | Microsoft migrated 3.0 drivers for models Microline 93, 192, 192+, 192, 193, 193+, 193, 391, 390, Laserline 6, 391, and 393 (color and B/W). New drivers shipping with 3.1 include ML 320 E/I, 320 Std, 321 E/I, 321 Std, 380, 390+, 391+, 393C (Color), and 393+, OL-400, -800, and -840. Low-end and phased-out drivers such as the ML 292 and ML 182 will not have 3.1 drivers; these can use the target emulation driver. Some drivers are available on CompuServe. |
| Packard Bell | ■ | ❑ | ❑ | ❑ | 818-886-4600 (M), 800-733-4411 (TS) | Packard Bell does not produce its own printer drivers. Instead, its laser printers use HP LaserJet Series II printer drivers, and its dot matrix printers use Epson LQ-850 printer drivers. |
| Panasonic Communications and Systems Co. | ■ | ■ | ■ | ■ (BBS #: 201-863-7487) | 201-348-7000 (M), 800-222-0584 (TS) | Panasonic's printer drivers for its KX-P1123, P1124, P1180, P1624, P1695, P4420, P4450, P4450i, and P4455 printers will all be bundled with Win 3.1. |
| QMS Inc | ■ | ■ | ❑ | ■ (BBS #: 205-633-3632) | 800-631-2692 (M), 205-633-4500 (TS) | QMS's printer drivers that have been migrated from Win 3.0 to 3.1—but are not upgrades—include ColorScript 100, PS-800, -800 Plus, -810, -820, and -2200. Drivers available from QMS include PS-410, -810, -815, -825, and -1500. |
| Tektronix Inc. | ■ | ■* | ■ | ❑ | 800-835-9433 (M), 800-835-6100 (TS) | Tektronix drivers for its Phaser II PX, II PXi and III PXi and a SuperPrint driver for its two older, non-PostScript models are included with Win 3.1. * Only older models require new driver versions. |
| Texas Instruments Inc. | ■ | ■ | ■ | ❑ | 800-527-3500 (M), 512-250-7407 (TS) | Texas Instruments' microLaser printer driver ships with Win 3.1. |
| Vantyper Inc. | ■ | ■ | ❑ | ■ (CompuServe forum: Desktop Publishing/ Service Bureau Utils) | 201-887-8000 (M), 900-370-2656 (TS) | Although Vantyper's VT-600 driver is bundled with Win 3.1, upgraded driver versions can be obtained through the mail or by downloading them from the vendor. |
| **SOUND BOARD DRIVERS** | | | | | | |
| Creative Labs Inc. | | | | | | |
| Sound Blaster | ■ | ■ | ■ | ■ (BBS #: 408-428-6660) | 408-986-1461 (M), 408-982-9226 (TS) | Sound Blaster's drivers are bundled with Win 3.1. They work with Multimedia Extensions. |
| Sound Blaster Pro | ■ | ■ | ❑ | ■ (BBS #: 408-428-6660) | 408-986-1461 (M), 408-982-9226 (TS) | Upgraded drivers for Sound Blaster Pro are available from Creative Labs. |
| Creative Multimedia Upgrade Kit | ■ | ■ | ❑ | ■ (BBS #: 408-428-6660) | 408-986-1461 (M), 408-982-9226 (TS) | Upgraded drivers for the Multimedia Upgrade Kit are available from Creative Labs. |
| Media Vision | | | | | | |
| Pro AudioSpectrum, 16 CDPC Thunder Board, Thunderport, Multimedia PC Upgrade Kit | ■ | ■ | ❑ | ■ (BBS #: 510-770-0968) | 800-638-2807 (M), 510-770-9905 (TS) | New drivers for Pro AudioSpectrum (MVAUX.DRV, MVFM.DRV, MVMIDI.DRV, MVWAVE.ZIP, MMMIXER.DLL, and MVMIXER.DRV) and Thunder Board (ADLIB.DRV and TBWAVE.DRV) are available upon request. |

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▣Adobe TypeSets for Business..... ea. 95.
6590 ▣Adobe Streamline 3.0 for Windows ... 125
7928 ▣Adobe Plus Pack 1.0..... 129
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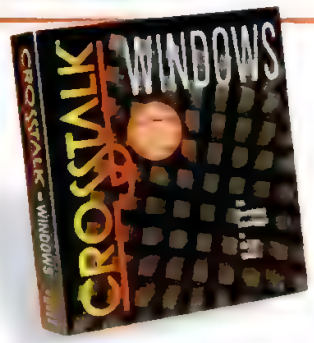


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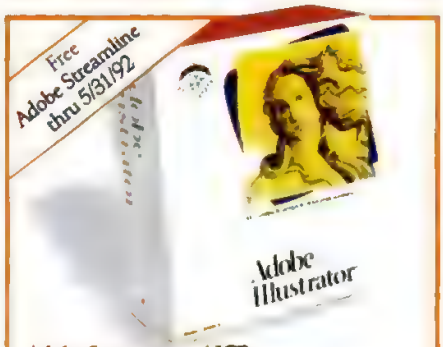


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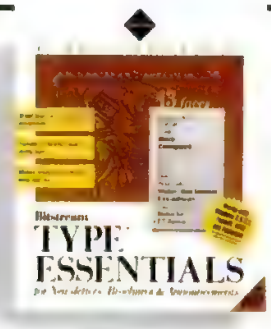


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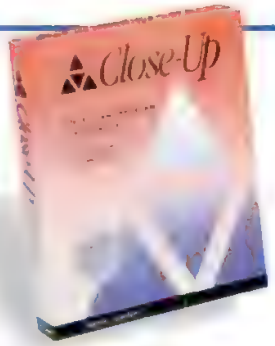


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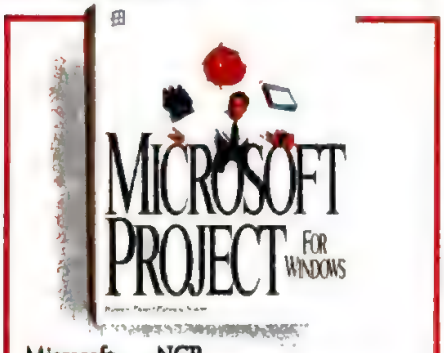
**XTREE ... NCP**
6161 ▣XTree Gold 2.5 ..... 99.




**Microsoft ... NCP**
7388 ▣ *Project 3.0 for Windows*–Take charge of your plans with the newest version of Microsoft's best-selling project management software. Includes a customizable toolbar and PlanningWizards ..... **$445.**

## RECREATIONAL/EDUCATIONAL

**Abracadata ... NCP**
3641 ▣Design Your Own Railroad ..... $39.
3629 ▣Design Your Own Home-Architecture 3.0 63.
3631 ▣Design Your Own Home-Interiors 1.0 .. 63.

**Broderbund ... CP**
8068 ▣Where in World is Carmen Deluxe ..... 49.
1836 ▣Where in America's Past is Carmen ... 39.
5851 ▣SimCity from Maxis ..... 29.
4388 ☐SimAnt from Maxis ..... 39.
4411 ▣SimEarth for Windows from Maxis .... 45.

**Davidson & Assoc. ... NCP**
3947 ▣Math Blaster Plus ..... 29.
4183 ▣KidWorks ..... 29.

**Electronic Arts ... NCP**
4534 ▣Mavis Beacon Teaches Typing 2.0 *(CP)* 35.
3031 ▣Mavis Beacon for Windows ..... 45.
3023 ▣ChessMaster 3000 ..... 35.

**Harvard Associates ... NCP**
2324 ▣PC Logo 3.0 ..... 59.

**HyperGlot Software ... NCP**
*(French, German, Italian, Spanish available.)*
☐Word Torture for Windows ..... ea. 34.
☐Word Torture 3.0 ..... ea. 29.

**Knowledge Adventure ... NCP**
1483 ▣Sports Adventure 1.0 ..... 55.
3861 ▣Knowledge Adventure 1.0 ..... 55.

**Cardinal ... 1 year**
*Cardinal 9600 Modem*–Superior American built quality. Supports V.32 9600 bps operation with V.42bis data compression for speeds up to 38,400. As written about in *Business Week* (8/19/91).
2783 *External* .. $349. 1480 *Internal* .. $329.

**Microsoft ... NCP**
7881 ☐Entertainment Pack I for Windows ..... 29.
2858 ☐Flight Simulator 4.0 ..... 39.

**Penton Overseas ... NCP**
▣VocabuLearn/ce Levels I & II *(French, Italian, German, Spanish, Russian, Hebrew and Japanese)* ..... ea. 35.

**Personal Training Systems ... NCP**
Training tutorials - beg. to adv. for Windows, Excel, PageMaker, & Lotus 1-2-3 *(3½")* ea. 65.

**Sierra ... CP**
9466 ☐Space Quest IV *(VGA)* ..... 45.
3193 ☐Police Quest III *(VGA)* ..... 45.

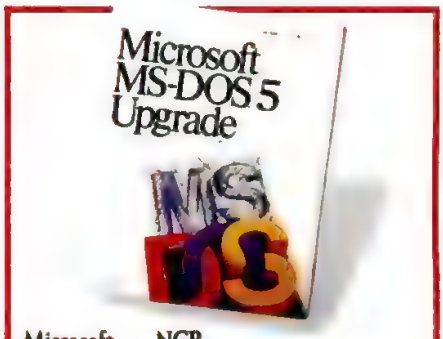
**Software Toolworks ... NCP**
3294 ▣Game Pak *(5 games in one)* ..... 32.
5032 Miracle *(piano teacher) (incl. kybd.)* .... 339.

**Spectrum Holobyte ... NCP**
4834 ▣Super Tetris ..... 29.
4833 ▣Super Tetris for Windows ..... 29.

**Toyogo ... NCP**
2701 ▣Nemesis Go Master 5.0 for Windows .. 35.
7674 ▣Nemesis Go Master 5.0 ..... 35.

**True BASIC, Inc. ... NCP**
▣Kemeny/Kurtz Math Series ..... ea. 45.

**Walt Disney Computer Software ... CP**
2629 ▣Mickey's 123's ..... 29.
2624 ▣Mickey's ABC's ..... 29.
4398 ▣The Animation Studio ..... 79.
4416 Sound Source ..... 29.




**Microsoft ... NCP**
1620 ☐ *MS-DOS 5 Upgrade*–Improved graphical shell, on-line help, task swapping, full screen editor, & more are all awaiting you w/MS-DOS 5 Upgrade. Upgrade your current DOS with ease to MS-DOS 5 Upgrade for only ... **$49.**

## HARDWARE

**Warranties listed next to manufacturer.**

**American Power ... 2 years**
7108 Smart UPS 400 ..... 339.
7105 Smart UPS 600 ..... 425.
3858 Back-UPS 400 ..... 185.
3823 Back-UPS 600 ..... 299.

**Appoint ... limited lifetime**
2469 Thumbelina PC ..... 62.
2480 Mouse Pen Pro PC ..... 62.

**ATI Technologies ... 2 years**
9821 VGA Basic-16 *(640 x 480, 16 colors)* ..... 69.
9985 VGA Integra *(1024 x 768, 16 colors)* ..... 95.
2706 VGA Wonder XL *(with 1 MB)* ..... 199.
2382 Graphics Vantage VGA *(with 1 MB)* .... 359.
9822 8514/Ultra *(with 1 MB) (requires VGA)* ... 419.
2012 Graphics Ultra with VGA *(with 1 MB)* .... 479.
1825 2400etc/i Modem *(with 9600 SendFax)* . 139.
9620 9600etc/e Modem ..... 369.
3902 Stereo•F/X ..... 149.
3900 VGA Stereo•F/X *(w/512K, upgrd. to 1 MB)* 329.

**Boca Research ... 5 years**
7150 BOCARAM/AT PLUS *(2 MB)* ..... 209.
7139 *(4 MB)* .... 319. 7138 *(8 MB)* .... 529.
6998 I/O Board for AT ..... 49.
6999 I/O Board for Microchannel *(S/S/P)* ..... 95.
8380 BasicVGA *(256K, 640 x 480)* ..... 49.
8381 SuperVGA *(1 MB, 1024 x 768)* ..... 119.
3859 2400 Internal Modem *(V.42, MNP Level 5)* 85.
2502 2400 Internal Modem ..... 49.

**Bravo Communications ... 2 years**
7400 2 Position Laser Compatible Switch Box. 109.

**Brown-Wagh ... 1 year**
8578 Creative Labs Sound Blaster ..... 109.
2336 Creative Labs Sound Blaster Pro ..... 189.

**Caere ... 1 year**
8158 Typist Plus Graphics ..... 389.

**Canon ... 1 year**
*We are an authorized Canon Service Center.*
7894 BJ-10ex Printer *(4.6 lb.)* ..... 329.
7897 BubbleJet Ink Cartridge *(BJ-10ex)* ..... 23.
7896 BJ-10ex Sheet Feeder ..... 75.

**Cardinal ... 1 year**
2719 MB2296SR Internal Send/Receive Fax .. 105.
1132 386-SX-16 Motherboard ØK ..... 279.
1197 386-SX-25 Motherboard ØK ..... 349.
2721 VGA732 True Color Ultra VGA Card .... 185.
1480 Cardinal 9600 Internal Modem ..... 329.
2783 Cardinal 9600 External Modem ..... 349.

**CH Products ... 1 year**
7935 Game Card III Auto .. 33. 7341 MCA .. 49.
7801 FlightStick with Falcon ..... 49.

**Colorado Memory Systems ... 1 year**
4194 Jumbo 120 Tape Backup ..... 199.
4354 Jumbo 250 Tape Backup ..... 269.

# anniversary year.

**Zoom Telephonics/Delrina Technology**
*Zoom 2400 Fax Modem/Delrina WinFax Pro Bundle*–
Get this great 9600 bps send/receive fax with 2400 baud modem along with Delrina's WinFax Pro at a special price. Offer good thru 4/30/92.
4400 *Int. Bundle* $155. 4401 *Ext. Bundle* $159.

**Curtis ... lifetime**
1708 Ruby-Plus SPF-2+ ..... 65.
7358 Command Center SPF-4 ..... 89.

**Cyrix Corporation ... 5 years**
*MATH COPROCESSORS*
9875 FasMath 83D87-25 ..... 165.
9876 FasMath 83D87-33 ..... 175.
9877 FasMath 83S87-16 *(SX compatible)* ..... 105.

**Epson ... 2 years**
*We are an authorized Epson Service Center.*
1906 FX-850 *(80 col., 264 cps, 9 pin)* ..... 319.
1904 FX-1050 *(136 col., 264 cps, 9 pin)* ..... 449.
2358 LQ-570 *(80 col., 252 cps)* ..... 289.
2361 LQ-870 *(80 col., 330 cps)* ..... 489.
2357 LQ-1170 *(136 col., 330 cps)* ..... 669.
5184 LX-810 *(80 col., 180 cps, 9 pin)* ..... 185.

**Everex ... 1 year**
1683 Tempo LX Notebook *(5 MB, 60 MB HD)* .. call

**Hauppauge Computer ... 1 year**
9870 25 MHz 386N Motherboard for AT *(1 MB)* 729.
9034 33 MHz 386N Motherboard for AT *(1 MB)* 789.

**Hayes ... 2 years**
7391 ULTRA 96 Modem ..... 669.
5024 ULTRA 144 Modem ..... 799.
1345 OPTIMA 24 Modem ..... 155.
3522 OPTIMA 96 Modem ..... 389.
9884 Pocket Edition 2400 ..... 119.

**Hewlett-Packard ... 1 year**
3957 LaserJet IIP Plus *(with toner)* ..... 879.
9993 LaserJet IIIP *(with toner)* ..... 1099.
6754 LaserJet III *(with toner)* ..... 1599.

**Intel ... 5 years**
3864 14.4EX Modem ..... 549.
6421 2400B MNP Internal Modem ..... 189.
6420 2400EX MNP Modem ..... 225.
7880 9600EX Modem ..... 469.
5336 Above Board Plus 8 2 MB ..... 429.
5342 Above Board Plus 8 I/O 2 MB ..... 459.
1086 Matched Memory Classic Memory Brd. 0K 139.
7782 SatisFAXtion *(fax board)* ..... 389.
8903 Matched Memory 4 MB *(PS/2)* ..... 239.
Matched Memory *(for LaserJet IIP, III, IIIP IIID)*
1810 1 MB ..... 79. 1787 2 MB ..... 149.
3076 Snap-In 386 *(for PS/2 50/60)* ..... 389.
3358 Power Pak *(Snap-In 386 & Above Board Microchannel 4 MB)* ..... 925.
*MATH COPROCESSORS*
7385 80287XL *(16 MHz 80286 CPU's)* ..... 89.
4750 80387SX *(16 MHz 80386SX CPU's)* ..... 129.
6830 80387SX-20 *(20 MHz 80386SX CPU's)* . 139.
5409 80387-33 *(80386DX CPU's)* ..... 219.

**Kensington Microware ... 1 year**
*Full line available. Partial listing.*
4973 PowerTree 20 *(6 outlets, EMI/RFI Filtering)* $27.
2582 Master Piece Plus ..... 99.
7899 Expert Mouse *serial* .. 99. 7900 *bus* .. 115.
3311 MasterStand ..... 59.
3312 LaserStand *(for HP LaserJet)* ..... 125.

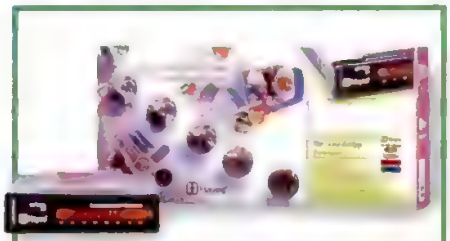
**Keytronic ... 3 years**
4518 101 Plus Keyboard ..... 99.

**Kraft ... 5 years**
5801 Game Card *(2 ports)* ..... 27.
5813 Game Card with Thunderstick ..... 49.
5800 3 button Thunder Joystick ..... 29.

**Logitech ... limited lifetime**
6029 Trackman *serial* ..... 69.
2343 Trackman Portable ..... 99.
7975 ScanMan 256 ..... 289.
1322 FotoMan *(camera for your PC)* ..... 549.
4727 Kids Mouse ..... 45.
3295 MouseMan *(combo)* 69. 9766 *(cordless)* 89.

**Megahertz ... 5 years**
3020 T224FM 96/24 Pocket Fax Modem .... 249.
1187 T324FM 96/24 Fax Modem *(Toshiba Laptops)* 269.

**Micron Technology ... 2 years**
7595 2 MB Expansion for HP LaserJet IIP or III 119.



**Hayes ... 2 years**
1345 *OPTIMA 24 Modem*–An affordable high-speed V.42bis modem with the reliability and quality that made Hayes famous. Supports throughput up to 9600 bps. Incl. Smartcom EZ communication software ..... $155.

**Microsoft ... lifetime**
7597 Microsoft Mouse *(bus or serial)* ..... 85.
2897 Mouse with Paintbrush *(bus or serial)* .... 99.
2898 Mouse with Windows 3.0 *(bus or serial)* . 149.
1896 Ballpoint Mouse *(serial only)* ..... 119.

**MicroSpeed ... 1 year**
2763 MicroTRAC *(serial & PS/2 interface)* ..... 57.
6330 PC-TRAC Trackball *(PS/2)* ..... 79.
6007 *serial* ..... 75. 6008 *bus* ..... 89.

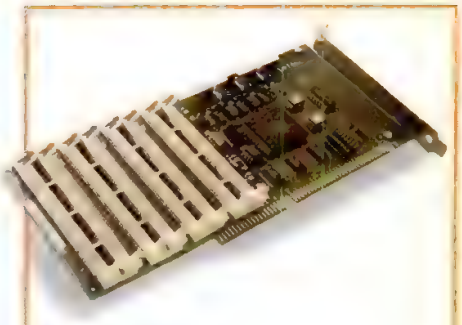
**Microtek ... 1 year**
2736 ScanMaker 600G *(gray-scale scanner)* .. 759.
2739 ScanMaker 600Z *(color scanner)* ..... 1249.
2740 ScanMaker 1850 *(slide scanner)* ..... 1649.

**Mouse Systems ... lifetime**
5997 Trackball *(1 yr. wrnty.) serial* .. 49. *bus* .. 59.
3213 PC Trackball II *(serial)* ..... 69.
7878 PC Mouse III *(serial)* .... 89. *(bus)* .... 95.

# 1-800/800-0004

MMC

**PC Connection** 950M
6 Mill Street
Marlow, NH 03456
**SALES** 603/446-7721 **FAX** 603/446-7791



**Intel ... 5 years**
1086 *Matched Memory Classic Memory Board 0K*–
Great performance with a great price to match. EMS 4.0 compatibility built in to the hardware for up to 90% faster processing. Expandable to 8 MB using 1 MB SIMMs ..... $139.

**NEC ... 2 years**
9441 CDR-36 Portable CD-ROM Drive ..... 399.
5161 CDR-73 CD-ROM Drive ..... 589.
2478 CD Gallery with CDR36 for PC ..... 579.
4252 Multisync 3FGX Monitor *(14")* ..... 689
4249 Multisync 4FG Monitor *(15")* 799

**Okidata ... 1 year**
*We are an authorized Okidata Service Center.*
5093 *OL400 Page Printer (4 ppm)* ..... 649.
5094 OL830 Page Printer *(8 ppm)* ..... 1329.
3025 Toner Cartridge ..... 25.

**Orchid Technology ... 4 years**
7863 ProDesigner VGA IIS *(with 1 MB, includes RAMDAC chip)* ..... 249.
4071 Fahrenheit 1280i with 1 MB ..... 365.

**Pacific Data ... lifetime/60 day MBG**
5072 25 Cartridges in One! *(for DeskJet 500)* . 109.
5071 25 Cartridges in One! *(for DeskJet Plus)* . 109.
6779 25 Cartridges in One! *(LJ II, IID, IIP, III, IIID)* 269.
8975 Complete Font Library *(LJ III, IIID, IIIP)* .. 265.
Memory upgrade for LJ IIP, III, IIID, IIIP:
7055 *2 MB* .... 139. 7759 *4 MB* ..... 259.
Memory upgrade for LaserJet II/IID:
6838 *2 MB* .... 249. 6836 *4 MB* ..... 369.
8090 Pacific Connect with 1.25 MB ..... 349.

**Pacific Data ... lifetime/60 day MBG**
9833 *PacificPage XL for HP LaserJet IIP/III/IIID/IIIP*–
High-speed PostScript emulation cartridge & accelerator board with 2 MB of memory. Output up to 8 times faster than stand-alone cartridges. 60 Day Money-Back Guarantee $699.

# PC CONNECTION®

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# We're 10 years old!

| | | |
|---|---|---|
| 7158 | Pacific Page PE *(LJ IID, IIP, III, IIID, IIIP)* | $369. |
| 6834 | Pacific Page *(for LJ II)* w/2 MB Mem. Brd. | 369. |
| 9833 | Pacific Page XL *(w/accelerator board)* | 699. |
| | **PC Power & Cooling ... 2 years** | |
| | *REPLACEMENT POWER SUPPLIES* | |
| 3203 | Turbo Cool 200 | 149. |
| 7915 | Turbo Cool 300 | 159. |
| | **Practical Peripherals ... lifetime** | |
| 3103 | 2400 Baud Internal Modem | 79. |
| 3102 | 2400 Baud External Modem | 169. |
| 8993 | 2400 Baud Internal Modem *(V.42 bis)* | 165. |
| 8994 | 2400 Baud External Modem *(V.42 bis)* | 199. |
| 4542 | 2400 Baud Internal Modem for PS/2 | 229. |
| 8132 | PM2400 Pocket Modem | 109. |
| 2266 | PM9600 Internal Modem | 399. |
| 7934 | PM9600SA Modem | 469. |
| 2264 | PM2400FX96 *(int. modem/fax board)* | 95. |
| 2425 | PM14400FXSA Modem/Fax | 399. |
| | **Prometheus ... 2 years** | |
| 1222 | ProModem Ultima Home Office | 489. |
| | **Targus ... lifetime** | |
| 1305 | Universal Notebook *(computer case)* | 69. |
| | **TheComplete PC ... 2 years** | |
| 5828 | TheComplete Communicator | 299. |
| | **Tripp Lite ... 2 years** | |
| 6199 | Isobar 4-6 *(4 outlets, Gold Seal Warranty)* | 49. |
| 6200 | Isobar 6-6 *(6 outlets, Gold Seal Warranty)* | 59. |
| 6201 | Isobar 8-12 *(8 outlets, Gold Seal Warranty)* | 69. |
| 6018 | LC1200 *(1200 Watt Line Conditioner)* | 159. |
| | **Video 7 ... 7 years** | |
| 9768 | VRAM II VGA 1 MB | 329. |
| | **Zoom Telephonics ... 7 years** | |
| 1307 | Int. 2400 Baud w/9600 Baud Fax Modem | 105. |
| 1178 | Ext. 2400 Baud w/9600 Baud Fax Modem | 115. |
| 1181 | 2400 Baud V.42 bis Modem *(2 year)* | 115. |
| 3574 | Ext. 2400 Baud V.42/9600 Baud Fax | 145. |
| 1167 | 2400 Baud Internal Modem | 65. |
| 1166 | 2400 Baud External Modem | 69. |
| 3075 | 9600 V.32 Turbo Internal Modem *(2 yr.)* | 329. |
| 1494 | 9600 V.32 Turbo External Modem *(2 yr.)* | 329. |
| 4400 | 24/96 Int. Fax Modem/WinFax Pro Bundle | 155. |
| 4401 | 24/96 Ext. Fax Modem/WinFax Pro Bundle | 159. |

**Canon ... 1 year**
*7894 BJ-10ex Printer*—New enhanced version of the popular 4.6 lb. printer provides laser-like print quality (up to 360 dpi) on plain bond paper, envelopes or transparencies. Available in white or gray ..... **$329.**

## DRIVES

| | | |
|---|---|---|
| | **Conner Peripherals ... 1 year** | |
| 2339 | CP30104 120 MB IDE HD *(19 ms)* | 399. |
| 1337 | CP3204 200 MB IDE HD *(16 ms)* | 599. |
| | **IOMEGA ... 1 year** | |
| | *We are an authorized Iomega Service Center.* | |
| 2224 | Bernoulli II Transportable 90 MB | 799. |
| 2616 | Internal 90 MB Bernoulli | 799. |
| 2500 | PC2B Controller | 199. |
| 2530 | 90 MB Cartridge | 149. |
| 2467 | 90 MB Cartridge Tripak | 439. |
| | **Mountain Network Solutions ... 2 years** | |
| 2917 | 40-60 MB Internal Tape Drive | 259. |
| 6153 | DC2120 Tape Cartridge *(5 pack)* | 149. |
| | **Pacific Rim ... 1 year** | |
| 1304 | 1.2 MB External *(for any parallel port)* | $239. |
| 2761 | 1.44EX MB External *(for any parallel port)* | 239. |
| | **Quantum ... 2 years** | |
| 8304 | Plus Hardcard II XL 50 MB *(9 ms)* | 299. |
| 8287 | Plus Hardcard II XL 105 MB *(9 ms)* | 449. |
| 4060 | 105 MB Drive Kit for MC PS/2's *(13 ms)* | 789. |
| | **TEAC ... 1 year** | |
| 4670 | 1.44 MB Drive for PC/XT *(3½")* | 59. |
| 4326 | 1.44 MB Drive for AT *(3½", w/Bastech)* | 79. |
| 4951 | 720k Drive for PC/XT *(3½")* | 55. |
| 6951 | 1.2 MB Drive for AT *(5¼")* | 65. |

## MEMORY

| | | |
|---|---|---|
| 6556 | 256k DRAM *(100 ns, set of 9)* | 19. |
| 5510 | 1 MB x 9 SIMMs *(80 nanosecond)* | 49. |
| 2497 | 4 MB x 9 SIMMs *(80 nanosecond)* | 179. |
| 5746 | 1 MB Chips *(80 ns, set of 9)* | 49. |
| 7813 | 256K x 4 Chips | ea. 7. |

**AddStor ... NCP**
4090 ▣ *SuperStor 2.0*—Doubles your disk capacity with an advanced, feature rich software only data compression product. Easy to install and use. Compatible with Windows and all applications ..... **$83.**

**Practical Peripherals ... lifetime**
*2425 PM14400FXSA Modem/Fax*—Get ultra high speed 14,400 bps data transmission as well as Group III S/R fax capabilities in one integrated and affordable package. Includes QuickLink II for modem and fax communications .. **$399.**

## DISKS/MEDIA

| | | | | |
|---|---|---|---|---|
| | **Fuji ... lifetime** | | | |
| 2215 | 3½" HD Disks *(10)* | 15. | 2241 *(50)* | 69. |
| 2239 | 3½" HD Disks Color *(Qty. 10)* | | | 18. |
| 2214 | 3½" DS Disks *(10)* | 9. | 2242 *(50)* | 39. |
| 2243 | 3½" DS Disks Color *(Qty. 10)* | | | 10. |
| | Fuji ¼" Data Cartridges | | | call |
| | **Sony ... lifetime** | | | |
| 3291 | 5¼" DS/DD 360k Disks *(Qty. 10)* | | | 7. |
| 3292 | 5¼" HD Disks *(Qty. 10)* | | | 12. |
| 3297 | 3½" DS Disks *(10)* | $9. | 6148 *(30)* | $25. |
| 3298 | 3½" HD Disks *(10)* | 15. | 6375 *(30)* | 42. |
| 1603 | DG60M 4mm Data Cartridge *(1.3 GB)* | | | 16. |
| 2520 | DG90M 4mm Data Cartridge *(2 GB)* | | | 22. |
| 1609 | QG112M 8mm Data Cartridge *(5 GB)* | | | 15. |
| 8185 | QD2040 Tape Cartridge | | | 14. |
| 3988 | QD2080 .... 19. | 1895 | QD2120 | 21. |
| 6715 | QD6150 .... 23. | 1602 | QD6250 | 29. |
| | **3M ... lifetime** | | | |
| 3943 | DC2000 .... 17. | 1581 | DC2120 | 24. |

## OUR POLICY

- We accept VISA and MASTERCARD.
- No surcharge added for credit card orders.
- Your card is not charged until we ship.
- If we must ship a partial order, we never charge freight on the shipment(s) that complete the order (in the U.S.).
- No sales tax, except Ohio residents (please add applicable tax).
- All U.S. shipments insured; no additional charge.
- APO/FPO orders shipped 1st Class Mail.
- International orders U.S. $250 minimum. Manufacturer support and upgrade eligibility may be limited outside the U.S.A.
- Upon receipt and approval, personal and company checks clear the same day for immediate shipment of your order.
- Corporate P.O.s accepted subject to approval.
- COD max. $1000. Cash or cashier's check.
- 120 day limited warranty on all products. Defective software replaced immediately. Defective hardware repaired or replaced at our discretion. All items subject to availability. Prices and promotions subject to change without notice.
- To order, call us Monday through Friday 8:00 a.m. to 1:00 a.m., or Saturday 9:00 a.m. to 5:30 p.m. Eastern Time. You can call our business offices at 603/446-3383 Monday through Friday 9:00 a.m. to 5:30 p.m.

**IOMEGA ... 1 year**
*2224 Bernoulli II Transportable 90 MB*—Rugged and built to last, this drive will absorb 1000 g's of shock and provide 90 MB of portable storage. Awards from *Byte* and *InfoWorld*. Requires adapter card ..... **$799.**

## SHIPPING

**Note:** Accounts on net terms pay actual shipping.

**Continental US:**

- For heavy hardware items such as printers, monitors, Bernoulli Boxes, etc. pay actual charges. Call for UPS 2nd-Day & Next-Day-Air.
- For all other items, add $3 per order to cover UPS Shipping. For such items, we automatically use Airborne Express at no extra charge if you are more than 2 days from us by UPS ground.

**Hawaii:**

- For monitors, printers, Bernoullis, computers, hard drives, and power backups, actual UPS Blue charge will be added. For all other items, add $3 per order.

**Alaska and outside Continental US:**

- Call 603/446-7721 for information.

# PC Parade.

**From Marlow to Main Street.**
**(Or, a decade of service to beat the band.)**

Back in July of '82, shortly after the introduction of the IBM-PC, we marched (to the beat of a different drummer, of course) smack dab into the middle of the PC marketplace. Our idea was simple—to sell add-ons and software exclusively for IBM personal computers. Our first warehouse was even simpler—a closet in a converted sawmill in the one-horse (or was that a moose?) town of Marlow, NH (pop. 542 at the time). Our goals were rather modest, too—we just wanted to be the fastest, most convenient, and most reliable source for PC products anywhere on Planet Earth.

Over the last ten years, we've learned that our small-town values play pretty well across America. And that anything humans can do, our high-stepping raccoon mascots can do better. So as our first decade draws to a close, we'd like to thank all our customers for making it so successful. May it never rain on your PC parade!

**We'll give you the shirt off our backs!**

The Official PC Connection 10th Anniversary Shirt, that is. A collector's item that can be worn with pride and panache at road races, corporate volleyball games, and even user-group meetings. It's free to anyone who places an order of $750 or more between now and June 30. Specify S, M, L, XL or children's.

**Display your micro muscles with the all-cotton PC Connection 10th Anniversary Shirt. One per customer. Not available to net accounts.**

PC CONNECTION®

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## COMPATIBILITY CHART

| ■—Yes ❑—No (Company) | Current version compatible with Windows 3.1 | Upgrade available | Upgrade shipping with Win 3.1 | Available via download | Telephone numbers (M=main, TS=technical support) | Comments |
|---|---|---|---|---|---|---|
| **SOUND BOARD DRIVERS (continued)** | | | | | | |
| Roland Corp US<br>Soundcards | ■ | ■ | ❑ | ❑ | 213-685-5141 | Roland's sound cards, the LAPC-1 and the SCC-1, and its interface card, MPU-IPC, use one driver for Windows (MP-401.DRV) that is distributed by Microsoft. |
| Turtle Beach Systems Inc.<br>MultiSound | ■ | ❑ | ■* | ❑ | 717-843-6916 | MultiSound's driver, MULTISND.DRV, is compatible with Win 3.1 and works with Multimedia Extensions. * This is a new product. Its current driver will be packaged with Win 3.1. |
| **TYPE MANAGERS** | | | | | | |
| Adobe Systems Inc. | | | | | | |
| *Adobe Type Library* | ■ | ❑ | ❑ | ❑ | 800-833-6687 (M), 415-961-0911 (TS) | Adobe says TrueType has no effect on its fonts' performance. |
| *Adobe Type Manager* 2.0 | ■ (all versions) | ❑ | ❑ | ❑ | 800-833-6687 (M), 415-961-0911 (TS) | Adobe says *ATM* is compatible with TrueType. |
| Bitstream Inc. | | | | | | |
| *FaceLift for Windows* 2.0 | ■ | ❑ | ❑ | ❑ | 617-497-6222 (M), 617-497-7514 (TS) | Bitstream says TrueType and *FaceLift* can coexist peacefully. *FaceLift* also works with Bitstream Speedo and PostScript Type 1. Version 1.2 works with Win 3.1 (with a fixable bug), and *FaceLift*, Version 1.0, will not work with Win 3.1. |
| Hewlett-Packard Co. | | | | | | |
| *Intellifonts for Windows* 1.1 | ■ | ■ | ❑ | ■ (CompuServe forum: HP Peripherals; prompt: GO HPPER; file: LaserJet Library4/ L3WIN3.ZIP) | 800-752-0900 (M), 208-323-2551 (TS) | While the current version does not utilize all of Win 3.1's latest features, it is fully compatible. Earlier versions also work, but they won't use many of 3.1's features. |
| IQ Engineering<br>Super Cartridge | ■ | ❑ | ❑ | ❑ | 800-765-3668 | The Super Cartridge 1 International Edition, Super Cartridge 2, Super Cartridge 3 Creative Collection and Professional Collection, and Super Cartridge DeskJet products work with Windows-standard Hewlett-Packard printer drivers. All work with Win 3.1. |
| MicroLogic Software | | | | | | |
| *MoreFonts* | ■ | ■ | ❑ | ❑ | 510-652-5464 | *MoreFonts* has on-the-fly-type scaling and a special-effects generator. User must choose between *MoreFonts* or TrueType as a scaling engine. |
| *Display Faces* 1.01, *Classic Faces* 1.01 | ■ | ■ | ❑ | ❑ | 510-652-5464 | These products have two components: typefaces and a conversion utility. The latter can convert *MoreFont* format fonts to Adobe Type 1, Atech, Agfa/Intellifont, TrueType, or URX formats. |
| Pacific Data Products Inc. | | | | | | |
| PacificPage PE<br>PacificPage II<br>PacificPage II/XL | ■ | ❑ | ❑ | ■ (BBS #: 619-452-6329 CompuServe: GO _PACDATA) | 619-552-0880 (M), 619-587-4690 (TS) | PacificPage II and PE are PostScript-language emulation cartridges that use the Apple LaserWriter II NTX as their specified output device in Win 3.1. PacificPage II includes a 2MB board. |
| Complete Font Library, FontBank Cartridge, 25 in One! | ■ | ❑ | ❑ | ■ (BBS #: 619-452-6329 CompuServe: GO_PACDATA) | 619-552-0880 (M), 619-587-4690 (TS) | These non-PostScript font packages (Complete being scalable, FontBank programmable, and 25 in One! using bitmaps) use one Win 3.1–compatible driver that ships with each package. |

An asterisk in any column indicates a footnote in the "Comments" column.

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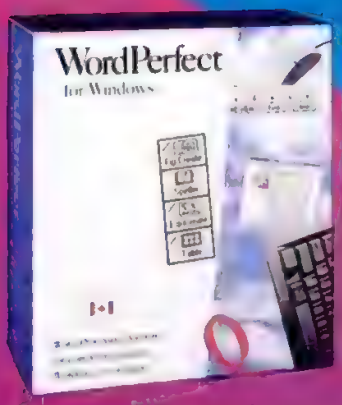

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## COMPATIBILITY CHART

■ Yes ❑ No

| Company | Current version compatible with Windows 3.1 | Upgrade available | Upgrade shipping with Win 3.1 | Available via download | Telephone numbers (Main, TS=technical support) | Comments |
|---|---|---|---|---|---|---|
| **UTILITIES** | | | | | | |
| Central Point Software Inc. | | | | | | |
| *PC Tools*, Version 7.1 | N/A* | N/A* | N/A* | N/A* | 503-690-8080 (M) 800-445-4208 (TS) | N/A*—Not applicable: Central Point would not comment on compatibility. |
| Symantec Corp. | | | | | | |
| Peter Norton Group *The Norton Desktop for Windows* 1.0 | ■ | ❑ | ❑ | ❑ | 800-441-7234 (M), 310-449-4900 (TS) | This product will run faster and smarter with Win 3.1. |
| *The Norton Utilities* 6.01 | ■ | ❑ | ❑ | ❑ | 310-449-4900 (TS) | Compatibility testing for earlier versions was not complete at the time of our survey. |
| **VGA DRIVERS** | | | | | | |
| Ahead Systems Inc. | ❑ | ■ | ❑ | ■ (BBS #: 510-623-0961) | 510-623-0900 | Ahead Systems has four video boards (VGA Wizard Deluxe 5.0 and 3270, VGA Eagle, and an XGA board). Drivers for these (WIN16.DRV, WIN256.DRV, and VDDVGA31.386) support a range of resolutions and color depths from standard VGA through 1,024-by-768 by 256 colors. Upgraded display and virtual device drivers are available directly from Ahead. |
| Appian Technology Inc. | ■ | ■ | ❑ | ■ (BBS #: 206-649-5363) | 408-730-5400 (M), 206-649-8086 (TS) | Appian offers 12 drivers, supporting all resolutions. Technical support must be contacted before downloading new drivers. There is no charge if the product is still under warranty. |
| ATI Technologies Inc. | | | | | | |
| Ultra Series | ■ | ■ | ❑ | ■ (BBS #: 416-756-4591) | 416-756-0718 (M), 416-756-0711 (TS) | Series has three boards (8514, Ultra, and Vantage) and seven drivers (Ultra640, Ultra800, Ultra, Ultrabig, Ultrags, Ultra128, 1280GS). Upgrades are available in two files: Ultra31.LZH and GS31.LZH. |
| VGAWonder XL Series | ■ | ■ | ■ (800x600 x16) | ■ (BBS #: 416-756-4591) | 416-756-0718 (M), 416-756-0711 (TS) | ATI has seven drivers for the ATI 28800 chip (modes 54h, 55h, 62h, 63h, 64h, 72h, and 73h) They handle a range of resolutions and color depths from standard VGA through 1,024-by-768 by 256 colors. A file containing four upgraded 3.1 drivers can be downloaded |
| Boca Research Inc. | ❑ | ■ | ❑ | ■ (BBS #: 407-241-1601) | 407-997-6227 (M), 407-241-8088 (TS) | Boca's VGA boards use NCR, ACMOS, and Tseng chip sets to display a full range of resolutions and color depths through 1,024-by-768 by 256 colors. Boca's SuperX VGA supports 32,768 colors and 800-by-600 and 640-by-480 modes. (3.1-compatible drivers should be ready soon after 3.1's release.) |
| Compaq Computer Corp. | ■ | ■ | ■ (Advanced VGA) | ❑ | 713-370-0670 (M), 800-345-1518 (TS) | Compaq has two sets of drivers Advanced VGA, which supports up to 800-by-600 by 16 colors and 640-by-480 by 256 colors, and Integrated VGA, which supports 640-by-480 by 16 colors. Win 3.1 will include a driver for the Advanced set |
| Diamond Computer Systems Inc. | ■ | ■ | ❑ | ■ (BBS #: 408-730-1100) | 408-736-2000 | Two boards (Speedstar and Stealth, working with Tseng ET-4000 and $S^3$ chip sets, respectively) work with 16 drivers supporting resolutions ranging from standard VGA through 1,024-by-768 by 256 colors and 1,280-by-960 by 16 colors. New 3.1 drivers are downloadable. |
| Everex Systems Inc | ■ | ❑ | ❑ | ■ (BBS #: 510-226-9694) | 800-821-0806 (M), 510-498-1115 (TS) | Everex has nine drivers supporting resolutions and color depths from standard VGA through 1,280-by-1,024 by 32,000 colors. All but one work with the Tseng Labs ET-4000 chip set. The remaining driver uses Acmos AVGA 1. |
| Focus Information Systems | ❑ | ■* | ❑ | ■ (BBS #: 510-657-9451) | 510-657-2845 (M), 510-657-4586 (TS) | Focus 2 the Max VGA 400 board uses Tseng's ET-4000 chip set and works with 12 drivers, offering resolutions and color depths ranging from standard VGA through 1,024-by-768 by 256 colors. * Within one month of 3.1's release. |
| Headland Technology/ Video Seven Inc. | ■ | ■ | ■ | ■ (BBS #: 510-656-0503) | 800-238-0101 (M), 800-248-1850 (TS) | One suite of drivers works with all of Video Seven's boards, which offer a range of resolutions and color depths from standard VGA through 1,024-by-768 by 256 colors. |

An asterisk in any column indicates a footnote in the "Comments" column.

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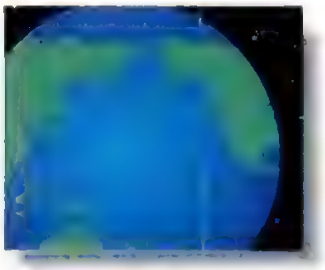

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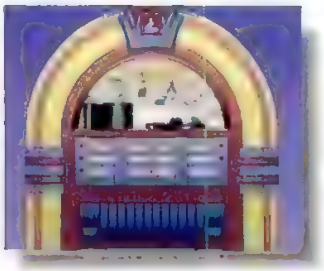

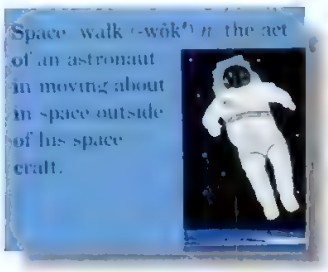


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## COMPATIBILITY CHART

| ■—Yes ❑—No<br>Company | Current version compatible with Windows 3.1 | Upgrade available | Upgrade shipping with Win 3.1 | Available via download | Telephone numbers (M=main, TS=technical support) | Comments |
|---|---|---|---|---|---|---|
| **VGA DRIVERS (continued)** | | | | | | |
| Hercules Computer Technology Inc. | ❑ | ■ | ■ | ❑ | 510-540-6000 (M), 510-540-0749 (TS) | Four Hercules cards (Graphic Station Card, Graphics Station GOLD, Graphics Station MC, and SuperStation 3D) are supported by the new 3.1 TIGA driver in resolutions ranging from 640-by-480 to 1,280-by-1,024. Although Win 3.1 will ship with a Hercules-compatible 256-color driver, Win 3.1 drivers for 32,768 colors and 16.7 million colors will be available from Hercules for $25. |
| Matrox Electronic Systems Ltd. | ■ | ■ | ❑ | ■ (BBS #: 514-685-6008) | 514-685-2630 (M), 800-462-8769 (TS) | Matrox has ten drivers, supporting resolutions and color depths from 4-bit 640-by-480 through 24-bit 1,600-by-1,200. |
| Micro-Labs Inc. | ■ | ■ | ❑ | ■ (BBS #: 312-648-1981) | 214-702-8654 | Micro-Labs' four Win 3.1–compatible boards (Ultimate VGA, VGA Plus, VGA/HiColor, and HiColor/65K) work with drivers supporting a range of resolutions and color depths from standard VGA through 1,024-by-768 by 256 colors and 1,280-by-1,024 by 16 colors. Drivers work with Tseng's ET-4000. BBS file WIN3.1 UPDATE under Files/Product Update/Windows 3.1 Update. |
| Micron Technology Inc. | ❑ | ■ | ❑ | ■ (BBS #: 208-368-2130) | 208-368-4400 (M), 800-642-7661 (TS) | The Ultra VRAM Super VGA Graphics card works with six drivers that support 640-by-480, 800-by-600, or 1,024-by-768 (16 colors) and 640-by-480, 800-by-600, and 1,024-by-768 (256 colors). It is compatible with the Chips and Technologies 82C453 chip set. |
| National Design Inc. | ■ | ■ | ❑ | ■ (BBS #: 512-343-5054) | 512-343-5055 (M), 800-253-8831 (TS) | NDI Volante Series drivers support TMS 34020 (640-by-480 by 24 colors, 800-by-600 by 24 colors, 1,024-by-768 by 8 or 24 colors, 1,280-by-1,024 by 16 colors, and 1,600-by-1,280 by 8 colors) and $S^3$ (640-by-480 by 8 colors to 1,024-by-768 by 8 colors). Upgrades up to 16.7 million colors are available on the BBS. |
| NEC Technologies Inc. Graphics Div. | ❑ | ❑* | ❑ | ■ (BBS #: 708-860-2602) | 708-860-9500 (M), 800-388-8888 ext.43 (TS) | NEC's current driver for its MultiSync Graphics Engine runs Windows in 800-by-600 or 1,024-by-768 with 16 or 256 colors, depending on system configuration. * When the anticipated downloadable upgrade is available, the filename will be MGEWN31.EXE. |
| Nth Graphics | ■ | ■* | ❑ | ■ (BBS #: 512-832-1962) | 512-832-1944 (M), 800-624-7552 (TS) | Engine 124 supports 640-by-480 by 32,768, 256, and 16 colors, 800-by-600 by 32,768, 256, and 16 colors, 1,024-by-768 by 16 and 256 colors, and 1,280-by-1,024 by 16 colors. NthTV True-Color supports all Engine 124 resolutions plus 640-by-480 by 32,768, 256, and 16 colors (all NTSC). Nth Engine/150 Display Controller uses Chips and Technologies' 480 chip set and supports 1,024-by-768 by 256 and 16 colors, and 1,280-by-1,024 by 256 and 16 colors. * Upgrades, available from Nth Graphics, reflect changes in installation procedures only. |
| Number Nine Computer Corp. | ■ | ■ | ■* | ■ (BBS #: 617-862-7502) | 617-674-0009 | * Number Nine provides Texas Instruments Graphics Architecture (TIGA) drivers with its boards. (See Texas Instruments below.) Supported resolutions run from 512-by-480 up to 1,280-by-1,024. |
| Orchid Technology Inc. | ■ | ❑ | ❑ | ■ (BBS #: 510-683-0327) | 510-683-0300 (M), 510-685-0540 (TS) | Orchid's Win 3.*x* driver supports resolutions and color depths of 640-by-480 by 256 and 32,768 colors, 800-by-600 by 16 and 256 colors, 1,024-by-768 by 16 and 256 colors, and 1,280-by-960 by 16 colors. |
| Panacea Inc. | ■ | ■ | ❑ | ■* (BBS #: 603-432-5193) | 603-437-5022 | The Win 3.1–compatible WinSpeed driver was released in January 1992. It costs $79. * A new setup utility is now available for current WinSpeed users to download. The driver supports resolutions through 640-by-480 by 256 colors, 800-by-600 by 256 colors, and 1,024-by-768 by 256 colors, and is compatible with Tseng's ET-4000 chip set and Trident, Paradise, Video Seven, and ATI VGA boards. |

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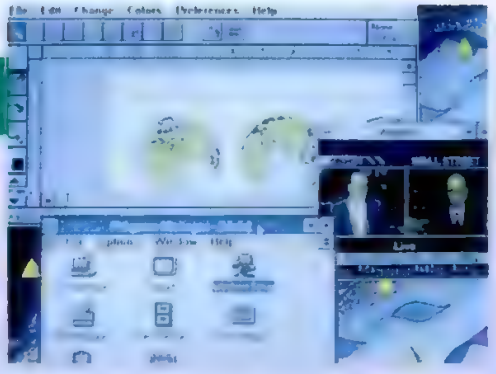

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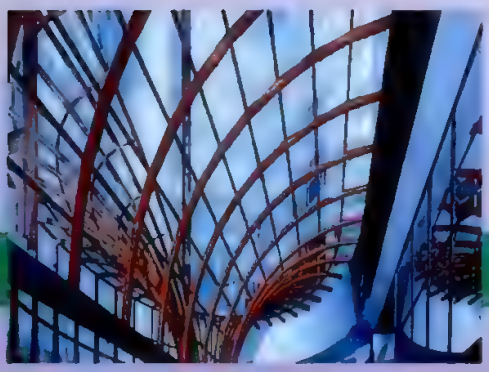

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## COMPATIBILITY CHART

■—Yes ❑—No

| Company | Current version compatible with Windows 3.1 | Upgrade available | Upgrade shipping with Win 3.1 | Available via download | Telephone numbers (M=main, TS=technical support) | Comments |
|---|---|---|---|---|---|---|
| **VGA DRIVERS (continued)** | | | | | | |
| Sigma Designs Inc. | ■ | ■* | ❑ | ■ (BBS #: 510-770-0111; CompuServe forum: DTP Vendor's Forum (GO_DTPVEN) | 510-770-0100 | The Sigma VGA Legend board's seven Tseng ET-4000–compatible drivers support standard VGA through 1,024-by-768 by 256 colors. Current drivers do not support 3.1's newest display features. * Available within 30 days of Win 3.1's release. |
| STB Systems Inc. | ■* | ■ | ❑ | ■ (BBS #: 214-437-9615) | 214-234-8750 (M), 800-234-4334 (TS) | STB's PowerGraph Ergo-VGA board's drivers work with Tseng ET-4000 and support all resolutions from 640-by-480 by 16 and 256 colors up through 1,280-by-1,024 by 16 colors. Contact tech support before downloading new drivers. STB supports 3.1 with drivers for the following chip sets: Tseng ET-4000 for the PowerGraph Ergo, Chips and Technologies' 450 and 480, and S³ 86C911 for the Wind/X GUI accelerator. * With minor changes to filenames. |
| Tecmar | ■ | ❑ | ❑ | ■ (BBS #: 216-349-0853) | 216-349-0600 (M), 800-344-4463 (TS) | Tecmar's drivers support resolutions of 640-by-480 by 16 colors, 640-by-480 by 256 colors, and 1,024-by-768 by 16 colors |
| Texas Instruments Inc. | ❑ | ■ | ■ | ❑ | 713-778-6592 (M), 800-232-3200 (TS) | Texas Instruments' Win 3.1 driver supports resolutions from 640-by-480 through 4,096-by-4,096, in monochrome or 16 through 256 colors. A supplemental disk from Microsoft includes a full-featured TIGA driver that supports up to 16.8 million colors. |
| Trident Microsystems Inc. | ■ | ❑ | ❑ | ■ (BBS #: 415-691-1016) | 415-691-9211 | Trident drivers support all resolutions from standard VGA through 1,024-by-768 by 256 colors. It also has special large-font drivers available for the higher resolutions. |
| Truevision Inc. | | | | | | |
| Truevision 1024/32 | ■* | ■ | ❑ | ❑ | 317-841-0332 | Truevision's 1024/32 board uses Tseng-supplied drivers: one for accelerated mode and the other for the Tseng Labs ET-4000 chip set's VGA mode. It supports up to 1,024-by-768 by 16.7 million colors. It works when TrueType is disabled in the Control Panel. |
| Bravado, VideoVGA | ■ | ■ | ❑ | ❑ | | VideoVGA and Bravado also use Tseng Labs drivers and support resolutions from standard VGA through 1,024-by-768 by 256 colors. * Setup is incompatible, but an upgrade is expected within 30 days of 3.1's release. |
| Targa Plus | ❑ | ■* | ❑ | ❑ | | Truevision's Targa Plus driver supports resolutions through 1,024-by-768 by 16.7 million colors. * An upgrade should also be available by mail from Truevision approximately 30 days after Win 3.1 ships. |
| Tseng Laboratories Inc. | ■ | ■ | ❑ | ■ (CompuServe forum: WINADV FORUM) | 215-968-0502 | Tseng supplies VGA chips to a number of OEMs offering both computer and add-in VGA boards. The company also supplies generic drivers that can be downloaded, free of charge, on CompuServe. |
| United Solutions Inc. | ■ | ■ | ❑ | ❑ | 310-645-3232 (M), 800-365-4995 (TS) | United has drivers for the Oak 067 chip set (640-by-480 by 256 colors, 800-by-600 by 16 or 256 colors, 1,024-by-768 by 16 colors), Trident 9000 (640-by-480 by 256 colors, 800-by-600 by 16 or 256 colors, 1,024-by-768 by 16 colors), Acmos AVGA 1 (800-by-600 by 6 colors), and Tseng ET-4000 chip set (640-by-480 by up to 16.7 million colors, 800-by-600 by up to 16.7 million colors, 1,024-by-768 by 16 or 256 colors). |
| ViewSonic | ❑ | ■ | ❑ | ■ (BBS #: 213-944-2195) | 213-946-0711 (M), 213-944-3041 (TS) | ViewSonic's PerfectView VGA board's drivers support resolutions of 640-by-480 by 16 or 256 colors, 800-by-600 by 16 or 256 colors, and 1,024-by-768 by 16 or 256 colors. The drivers support Tseng Labs' ET-4000 chip. |
| WellCom Corp. | ■* | ■ | ❑ | ❑ | 408-441-6499 (M), 408-441-4482 (TS) | Wellcom's Well VGA 80 board's drivers support resolutions from 640-by-480 by 16 colors up to 1,024-by-768 by 256 colors and 1,280-by-1,024 by 16 colors. * Install instructions for the current drivers will have to be changed. |

An asterisk in any column indicates a footnote in the "Comments" column.

CONTINUES

## COMPATIBILITY CHART

| ■ Yes ❑ No<br>Company | Current version compatible with Windows 3.1[1] | Upgrade available | Upgrade shipping with Win 3.1 | Available via download | List price | Telephone numbers (M=main, TS=technical support) |
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| **DISK CACHES** | | | | | | |
| The Aldridge Co.<br>*Cache86*, Version 4.0 | ■ | ❑ | ❑ | ❑ | $49.95 | 800-548-5019 (M), 713-953-1940 (TS) |
| Software Matters Inc.<br>*Flash* 8.16 | ■ | ■ | ❑ | Call technical support for more info | $69.95 Upgrade: $25 00 | 800-253-5274 (M), 317-253-8088 (TS) |
| Hyperware<br>*Hyperdisk* 4 31 | ■ (Versions 4.11 and up) | ❑ | ❑ | ■ (BBS #: 615-864-6871) | $69 00 commercial, $49.00 private | 615-864-6868 (M), 615-864-6869 (TS) |
| Multisoft Corp.<br>*Super PC-Kwik* 4.1 | ■ | ❑ | ❑ | ❑ | $79.95 | 800-365-5945 (M), 800-888-5945 (TS) |
| Golden Bow Systems<br>*Vcache* 5.06 | ■ | ❑ | ❑ | ❑ | $69.95 | 800-284-3269 (M), 619-298-9349 (TS) |
| **MEMORY MANAGERS** | | | | | | |
| RYBS Electronics Inc.<br>*ATLast!* | ■ (Versions 5.0 and up) | ❑ | ❑ | ❑ | $79.95 | 303-444-6073 (M), 303-444-7927 (TS) |
| V Communications Inc.<br>*Memory Commander* Version 2.1 | ❑ | ■ | ❑ | ❑ | $99.95 Upgrade: $29 95 | 408-296-4224 (M), 408-296-4385 (TS) |
| Digital Research<br>*MemoryMax* (EMM386) | Info not available | Info not available | Info not available | Info not available | N/A | 408-649-3896 |
| Helix Software<br>*Netroom* 2.2 | ■ (Versions 2.0 and up) | ❑ | ❑ | ❑ | $99.00 Single user | 800-451-0551 (M), 718-392-3735 (TS) |
| Quarterdeck Office Systems<br>*QEMM-386* | Info not available | Info not available | Info not available | Info not available | $99.95 | 310-392-9851 (M), 310-392-9701 (TS) |
| Quadtel<br>*QMAPS* and *UMBPro* 2.1 | ■ | ■ | ❑ | ❑ | Free (Upgrade) | 714-754-4422 (M), 714-754-4017 (TS) |
| Qualitas Inc.<br>*386MAX* | ■ (Versions 5.10 and up) | ❑ | ❑ | ❑ | $99.95 | 301-907-6700 (M), 301-907-7400 (TS) |

[1] Except as indicated, previous versions of the product may not be compatible with Windows 3.1.

ENDS

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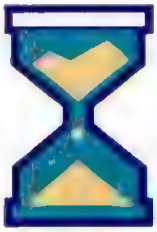

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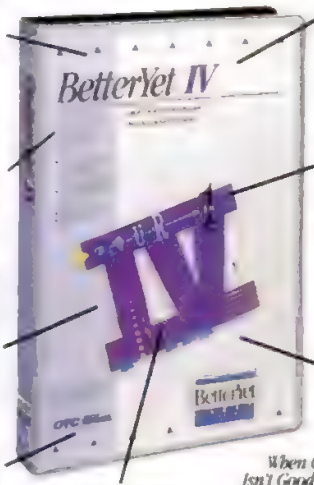


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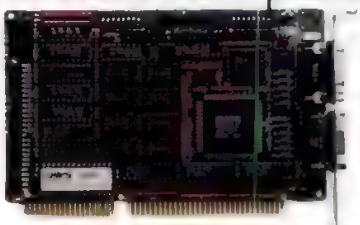

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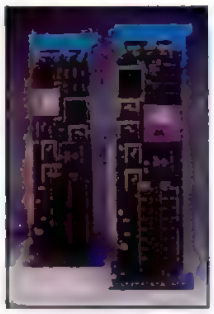

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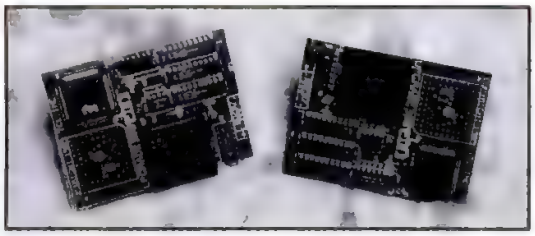

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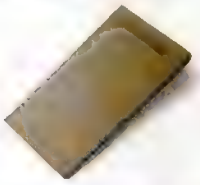

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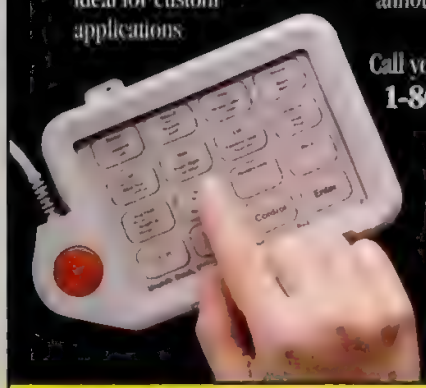

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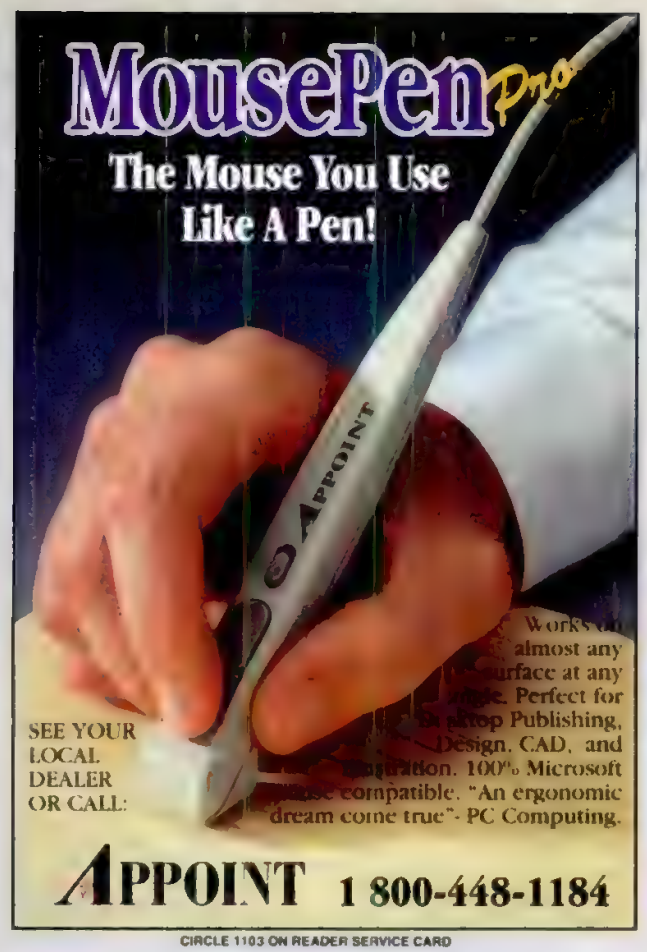


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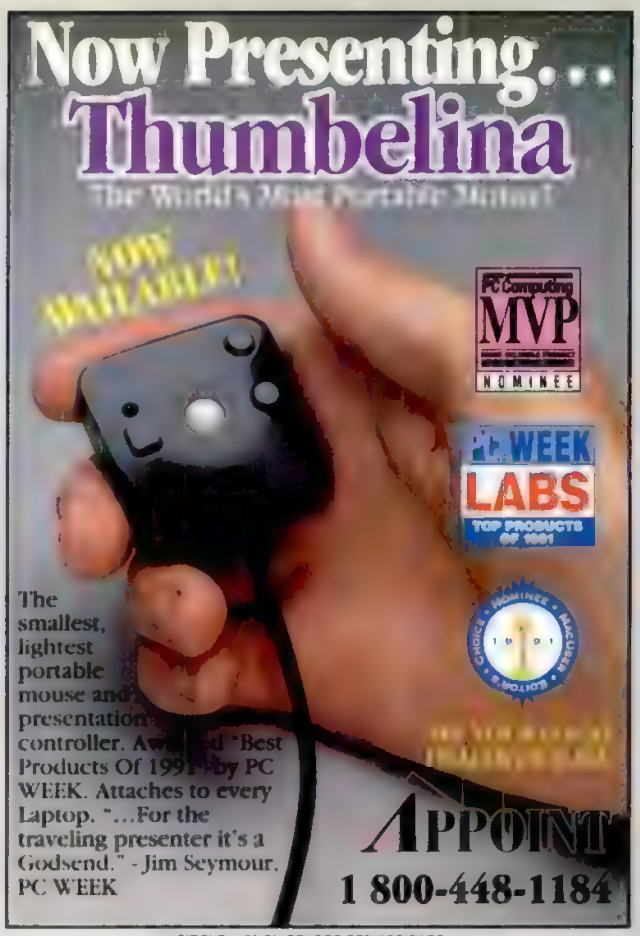


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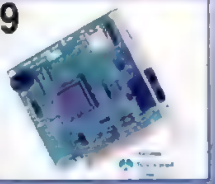

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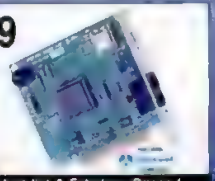

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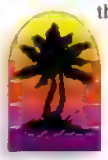

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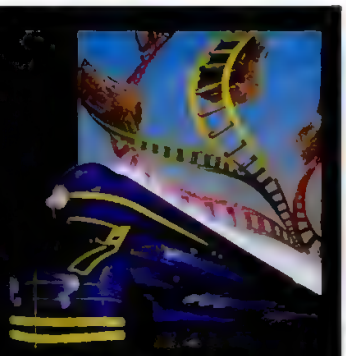

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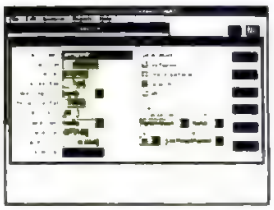

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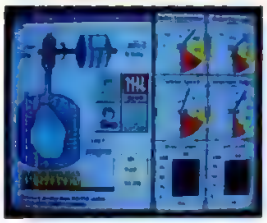

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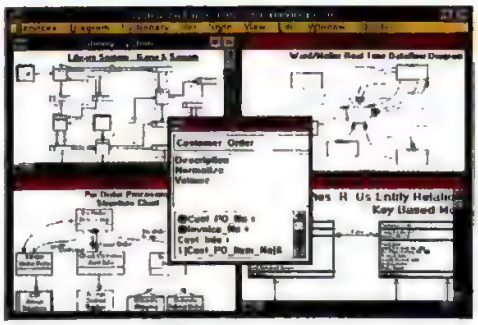

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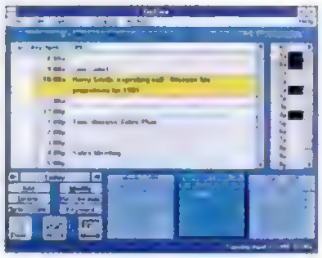

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PC WEEK ANALYST'S CHOICE

is little short of sensational
L.R. Shannon September 24, 1991
The New York Times

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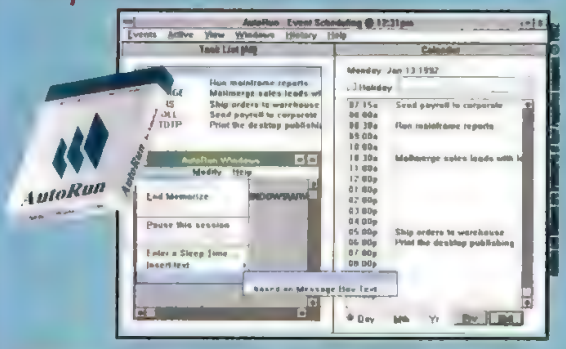

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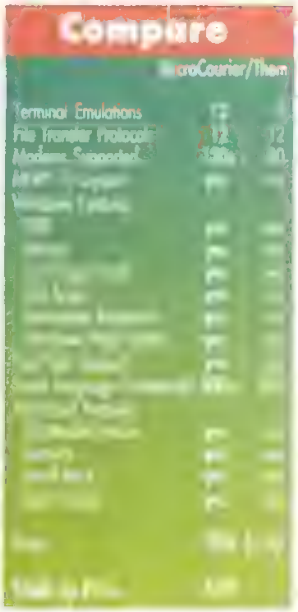

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# "Carbon Copy for Windows is the closest thing to having remote control built into Windows itself." *Windows Magazine*

| True Windows Application | |
|---|---|
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| pcAnywhere | No |
| Close Up | No |
| CoSession | No |

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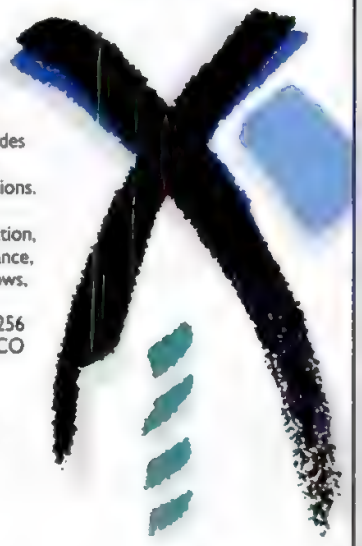

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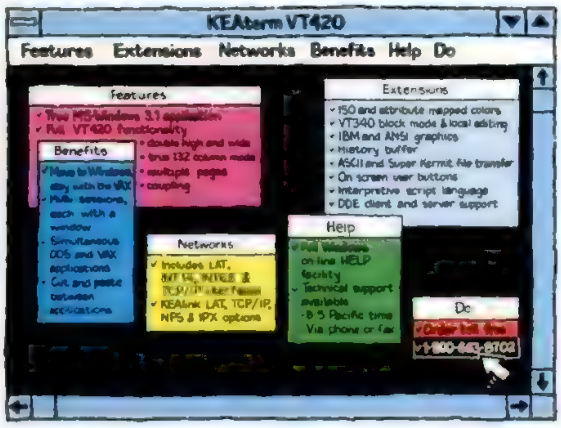


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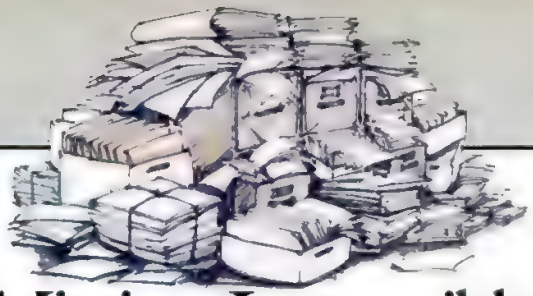

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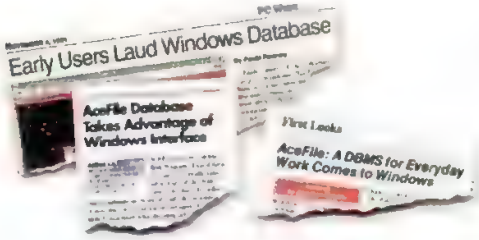


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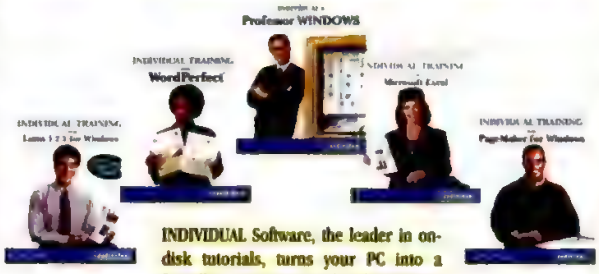


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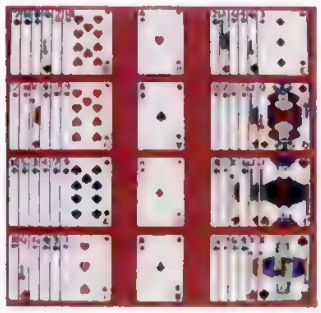

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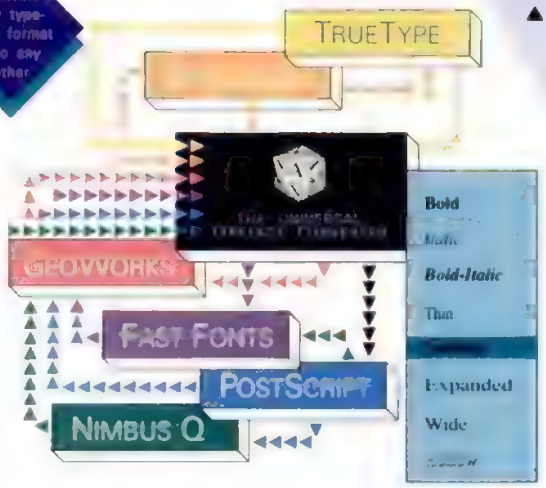


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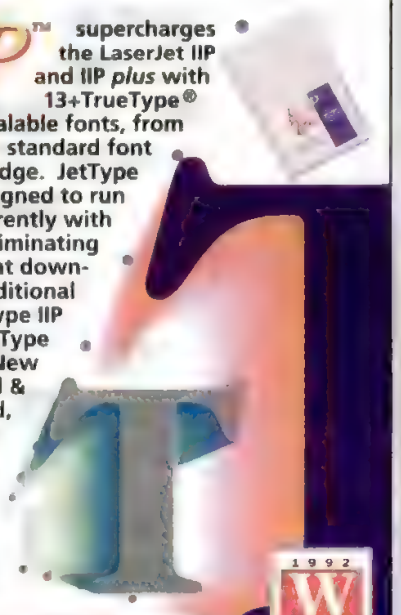

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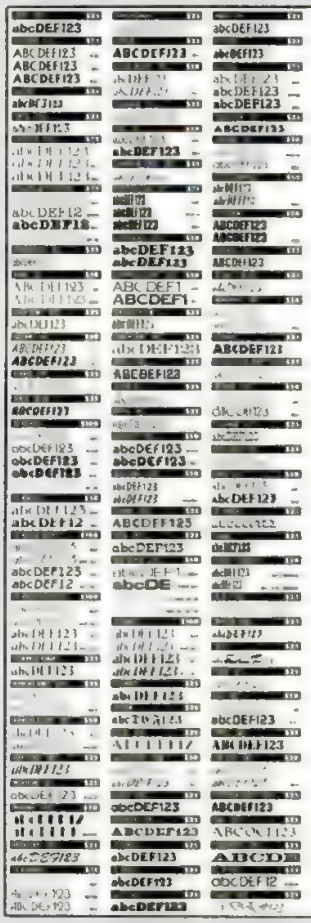

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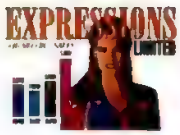


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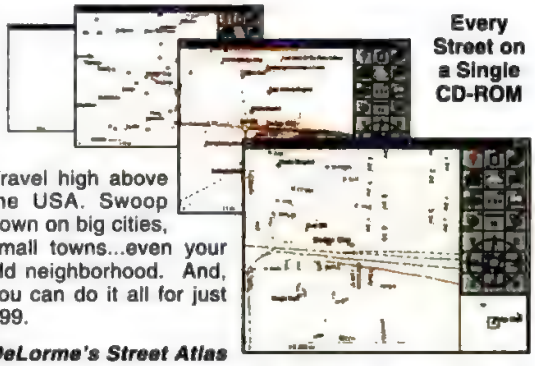

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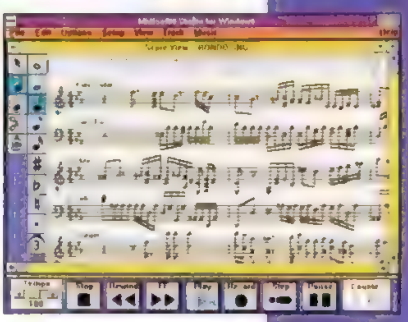

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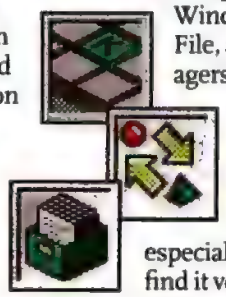

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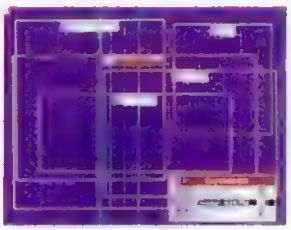

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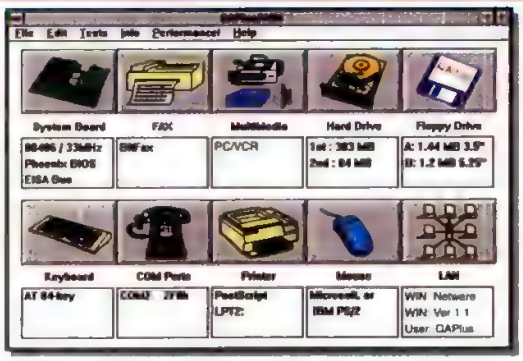


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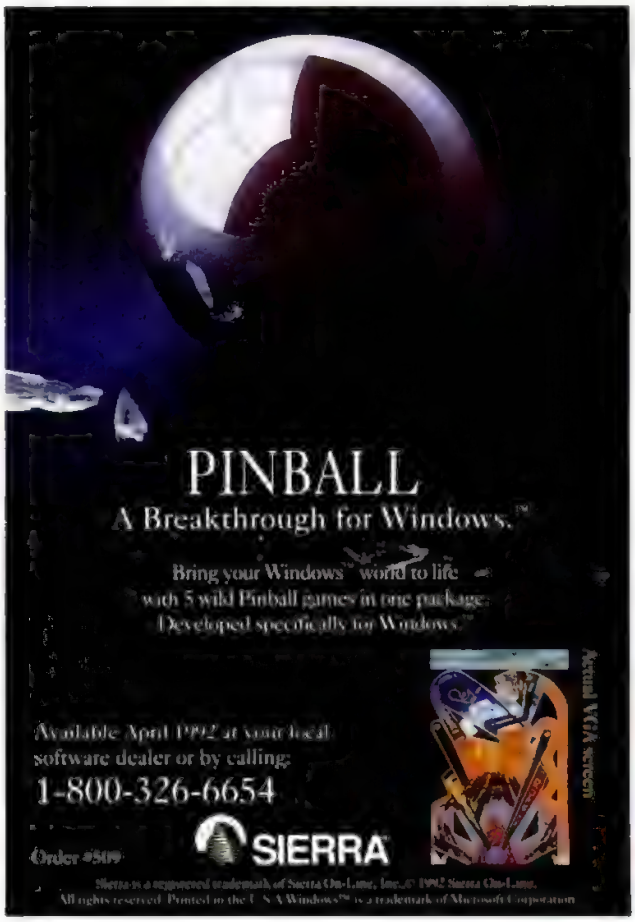


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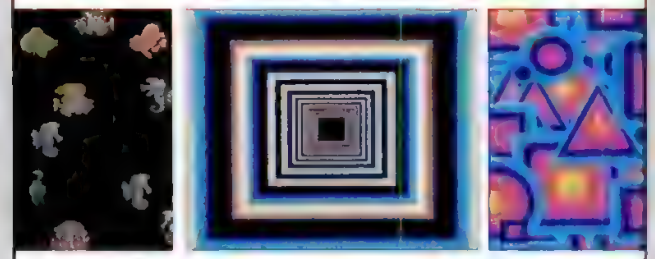

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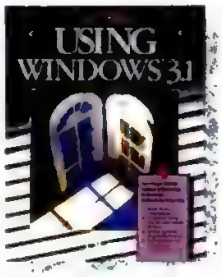


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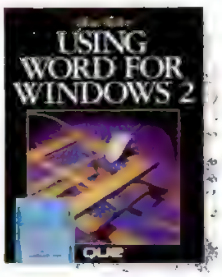


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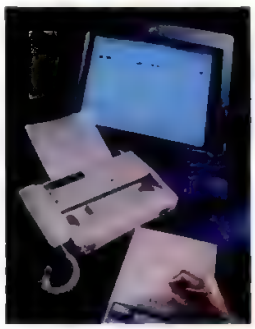

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Master Computer based its video subsystem on the Diamond SpeedSTAR Super VGA adapter. A popular choice among the machines in this test group, it demonstrated good performance on the Windows Graphics test as well as the video test. Aided by a Tseng ET4000AX chip with 1MB of 80-nanosecond DRAM, the SpeedSTAR displays 256 simultaneous colors at all resolutions from 640 by 480 through 1,024 by 768. The 14-inch Arche Multi VGA monitor shipped with the Model 412 also supports all resolutions, noninterlaced, for a crisper display at a 70-Hz refresh rate. Unfortunately, it started to bleed in the lower-right-hand corner after two weeks of operation, displaying a myriad of unwanted colors.

Within the case, the video, multifunction I/O, and IDE pass-through cards took up three of the eight 16-bit expansion slots. The rightmost slot allows only a half-length card, since the hard disk resides inside the second of two vertical 3.5-inch drive bays. Next to these are three horizontal 5.25-inch drive bays, bringing the total to five. Since the 200-watt power supply comes with only four device connectors, you will need to purchase an inexpensive Y splitter in order to fill all five bays.

The Cascade 386SX Model 412's 12-month warranty covers all parts and labor, but telephone support requires a toll call. Hours are weekdays 9:00 to 6:00 P.S.T, and Master Cascade will pay for shipping if your PC requires service.
—*Mario Baldasserini*

**MICRO EXPRESS**

## ME 386-SX/25/Caching

**ME 386-SX/25/Caching, $1,564**

Micro Express's ME 386-SX/25/Caching is a standard small-footprint desktop system that includes a fast disk subsystem but otherwise average-performing components.

The $1,564 Micro Express came with a Dash system board, the same used by the Ares 386-25SX Cache reviewed in this issue. It has 4MB of 60-nanosecond DRAM (expandable to 16MB) and a 64K 25-ns. direct-mapped posted-write RAM cache subsystem. Six of the unit's eight 16-bit ISA slots remain after you install the video card and IDE pass-through card, which also controls the I/O ports.

The 17-millisecond 120MB Quantum ProDrive LPS 120-AT hard disk in our test system produced outstanding performance, thanks to its 256K read/write integrated cache. Because it yielded on average a 100 percent increase in performance over other hard disks on PC Labs' disk test, we recommend this excellent IDE-interface unit for disk-intensive applications.

For video, the Micro Express unit uses a Pixel Engineering F/X Series Super VGA board with a Tseng ET4000AX chip and 1MB of RAM. Also present on the board is a Sierra Hi-Color DAC that supports 32,768 colors and can display 2,048 simultaneous colors in 800-by-600 resolution. At 1,024-by-768, the board displays 256 simultaneous colors. The monitor is a 14-inch noninterlaced TVM capable of a noninterlaced 800-by-600 resolution.

On the remainder of PC Magazine Labs' benchmark tests, the Micro Express unit's video as well as its processor and memory performance was middle of the road, with no exceptional results. Its performance on the Windows Graphics benchmark test was also average.

One interesting feature of the Micro Express system is an integrated Canon 1.2MB/1.44MB floppy disk drive, which occupies only one drive bay and uses only one power connector. This is a noteworthy feature, considering that the 200-watt Solotek power supply has only three full-size connectors and two 3.5-inch floppy disk drive connectors to match the three 5.25-inch and two 3.5-inch (one internal) drive bays.

Micro Express's documentation was detailed enough to answer our technical questions. Toll-free technical support is available weekdays from 8:00 to 5:30 P.S.T. The vendor performs all service unless you select TRW's on-site service (for a first-year charge of $50). Micro Express pays shipping charges both ways for the first 4 months of the 15-month war-

**PC LABS' BENCHMARK TESTS 6.0**

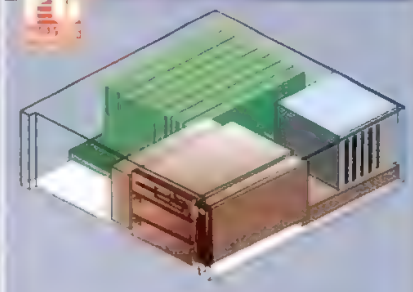
**ME 386-SX/25/Caching**

| Test Scores | | Systems in this review | | |
|---|---|---|---|---|
| | | Worst | Best | Average |
| Processor | 128 | 115 | 132 | 125 |
| Memory | 3,072 | 1,946 | 3,358 | 2,776 |
| Disk | 389 | 143 | 394 | 226 |
| Video | 3,247 | 1,445 | 3,977 | 3,202 |
| Windows Graphics | 1,746 | 694 | 2,091 | 1,559 |

**In Short:** The $1,564 ME 386-SX/25/Caching produced a good disk score and gave otherwise slightly above-average performance. This system features a caching Dash motherboard, a Quantum ProDrive hard disk with a 256K cache, and a Pixel Engineering Super VGA card with a Sierra RAMDAC.

***An integrated 1.2MB and 1.44MB floppy disk drive uses only one connector on the ME 386-SX/25/Caching's power supply.***

**FACT FILE**



**ME 386-SX/25/Caching**
Micro Express, 1801 Carnegie Ave., Santa Ana, CA 92705; 800-989-9900, 714-852-1400; fax, 714-852-1225.
**List price (tested configuration):** $1,564.
**Memory and processor RAM cache:** 4MB 60-ns. SIMMs, 64K cache.
**Disk drives and controller:** Quantum 17-ms. 120MB IDE hard disk, Micro Express controller with 256K cache, 1.2MB and 1.44MB floppy disk drive.
**Display:** Micro Express 1,024-by-768 adapter with 1MB RAM, TVM 14-inch monitor.
**Monitor refresh rate:** 70 Hz.
**Software:** DOS 5.0.

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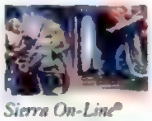
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ranty. This warranty excludes the hard disk and monitor, which are covered for only one year.—*Mario Baldasserini*

**NATIONAL MICRO SYSTEMS INC.**

## Flash 386SX-25C

**Flash 386SX-25C, $1,499**

The Flash 386SX-25C, from National Micro Systems, has video componentry that produces good color, but this PC was disappointing in terms of its benchmark test performance. Its scores were average and also reflected the system's slow hard disk.

Selling at $1,499 with DOS 5.0 included, the Flash 386SX-25C has an OPTi motherboard with 4MB of 70-nanosecond DRAM and a 16K 25-ns. direct-mapped posted-write RAM cache. This small cache, expandable to 64K, scored ninth on PC Magazine Labs' memory benchmark test and eighth on our processor test. Since our test group included six machines with 64K caches and one with 32K, the Flash 386SX-25C was outclassed by many of its competitors but managed to come in ahead of a few of them on the memory test.

Also on the motherboard are two 8-bit and six 16-bit slots, and two of the latter are occupied by the video and the multifunction card. The multifunction card has IDE pass-through circuitry and interfaces for the one parallel and two serial ports. The 1.2MB and 1.44MB floppy disk drives connect to the IDE card, as can one more hard disk. The hard disk that the company supplied is the 120MB 15-millisecond Maxtor 7120AT, which—despite a 32K read-ahead cache—produced the lowest score on our disk test.

The Flash 386SX-25C's video subsystem consists of a Pixel Engineering Turbo F/X card featuring 1MB of RAM, a Tseng ET4000AX chip, and a Sierra Hi-Color DAC chip, which supports 32,768 colors at 640-by-480, 800-by-600, and 1,024-by-768 resolutions—a plus for graphics users. The CTX monitor supports noninterlaced modes up to 800 by 600 (with a 60-Hz refresh rate). On the video test, the video subsystem ended up midpack but nearly bottomed out on our Windows Graphics test.

The documentation that came with the Flash 386SX-25C was compiled from individual component manuals, but the company offers toll-free support, available weekdays from 9:00 to 5:30 E.S.T., with parts shipping. Warranty coverage is 15 months on parts (12 months on the monitor) and 24 months on labor. For major repairs, shipping to National Micro Systems is necessary unless you have selected General Electric's on-site service at $75 for the first year only. The company claims a turnaround time of 24 to 48 hours on service.—*Mario Baldasserini*

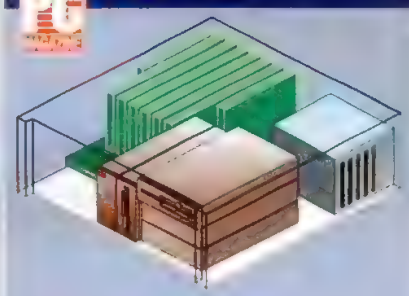
**PC LABS' BENCHMARK TESTS 6.0**

**Flash 386SX-25C**

| Test Scores | | Systems in this review | | |
|---|---|---|---|---|
| | | Worst | Best | Average |
| Processor | 128 | 115 | 132 | 125 |
| Memory | 2,844 | 1,946 | 3,358 | 2,776 |
| Disk | 144 | 143 | 394 | 226 |
| Video | 3,385 | 1,445 | 3,977 | 3,202 |
| Windows Graphics | 794 | 694 | 2,091 | 1,559 |

**In Short:** The $1,499 Flash 386SX-25C yielded poor performance on our disk and Windows Graphics benchmark tests and turned in run-of-the-mill scores on the others. A 32K buffer on the 15-millisecond Maxtor IDE hard disk did little to help disk speed.

**FACT FILE**



**Flash 386SX-25C**
National Micro Systems Inc., 2979-B Pacific Dr., Norcross, GA 30071; 800-642-7649, 404-446-0520; fax, 404-449-5297.
**List price (tested configuration):** $1,499.
**Memory and processor RAM cache:** 4MB 70-ns. SIMMs, 16K cache.
**Disk drives and controller:** Maxtor 15-ms. 120MB IDE hard disk, TIC controller with 32K cache, 1.2MB and 1.44MB floppy disk drives.
**Display:** National Micro Systems 1,024-by-768 adapter with 1MB RAM, CTX 14-inch monitor.
**Monitor refresh rate:** 60 Hz.
**Software:** DOS 5.0.

CIRCLE 468 ON READER SERVICE CARD

**NORTHGATE COMPUTER SYSTEMS INC.**

## Northgate 386SX/25

**Northgate 386SX/25, $2,049**

Northgate Computer Systems typically delivers machines that offer some of the best price and performance values. But while the Northgate 386SX/25 is priced competitively for this roundup, Northgate has ignored some obvious performance perks, such as a processor RAM cache and a fast Super VGA adapter, making for a vanilla, small-footprint system.

Northgate used its own motherboard in this $2,049 unit, populating it with Chips and Technologies and OPTi chip sets, an AMI BIOS, and six 16-bit ISA slots—two of them taken up by the video adapter and a multifunction card. The latter offers IDE pass-through circuitry, floppy disk drive connections, and control of the one parallel, two serial, and one game port. You can expand the system's 4MB of 80-nanosecond DRAM to 16MB by replacing the installed 1MB SIMMs with 4MB SIMMs. As configured, the Northgate can support an additional 16MB.

All five bays are accessible: three 5.25-inch horizontal half-heights and two 3.5-inch vertical slimlines. Toshiba 1.2MB and 1.44MB drives fill one of each. The other vertical bay holds a 19-millisecond

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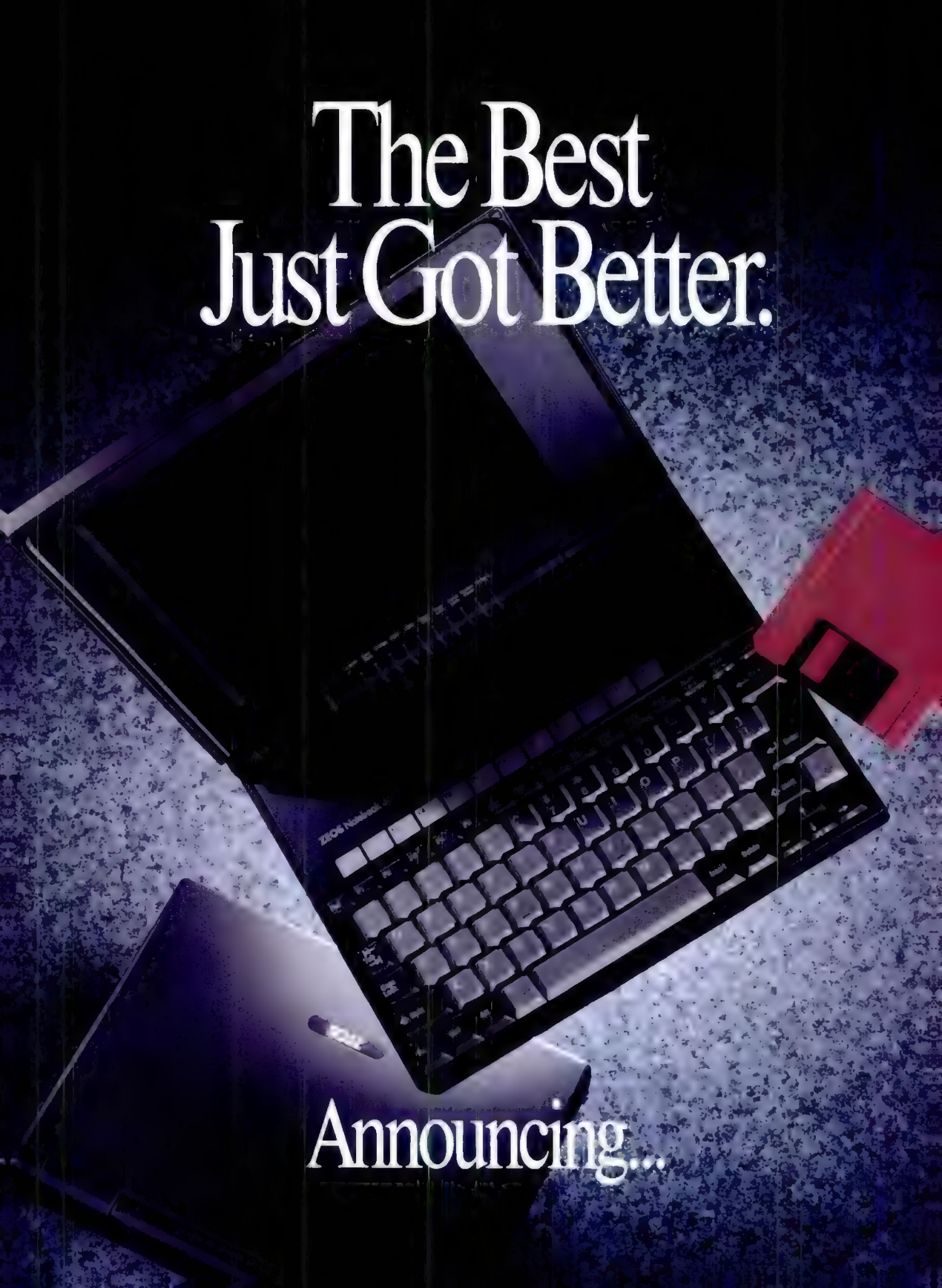


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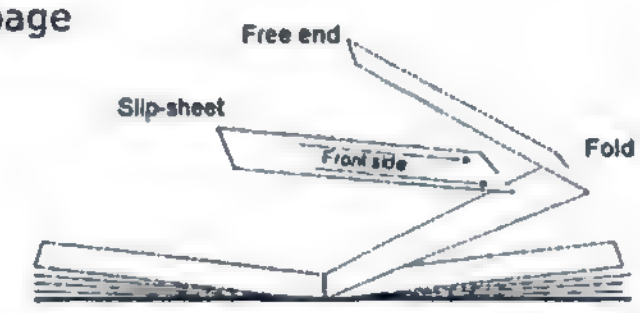


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**PC LABS' BENCHMARK TESTS 6.0**

**Northgate 386SX/25**

| Test Scores | | Systems in this review | | |
|---|---|---|---|---|
| | | Worst | Best | Average |
| Processor | 118 | 115 | 132 | 125 |
| Memory | 2,419 | 1,946 | 3,358 | 2,776 |
| Disk | 167 | 143 | 394 | 226 |
| Video | 2,126 | 1,445 | 3,977 | 3,202 |
| Windows Graphics | 694 | 694 | 2,091 | 1,559 |

**In Short:** Despite its TMC Research motherboard, the uncached, $2,049 Northgate 386SX/25 was disappointing in many respects. It turned in poor processor and memory benchmark test scores, and the Avgai video chip set yielded poor video performance.

106MB Toshiba MK-1034FC IDE hard disk that performed well on PC Magazine Labs' disk benchmark test against other uncached IDE units.

The Northgate came with an Image 800 Super VGA card that had an AVGAI chip set and 256K of video RAM. Compared with the other tested PCs (whose adapters had 1MB of video RAM, except for one unit, which had 512K), this board turned in the lowest score on our Windows Graphics test and the next-lowest on the video test. It supports 16-color noninterlaced resolution up to 800 by 600; the Panasonic PanaSync C1381i monitor also supports noninterlaced resolutions up to 800 by 600 at a 60-Hz refresh rate.

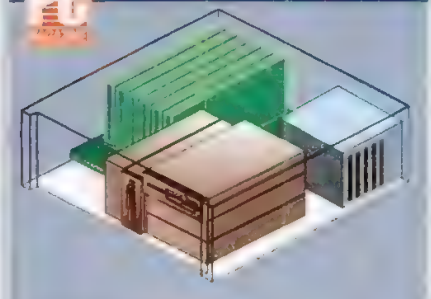
Because the Northgate does not have a processor RAM cache—even as an option—its results on the processor and memory tests were below average compared with the units that had a cache. Against units without a cache, however, the Northgate performed well.

The Northgate 386SX/25 ships with DOS 5.0 (or earlier versions if preferred), Microsoft Windows 3.0, and DIAGsoft's *QA Plus* diagnostic software.

The documentation, however, was written for a number of Northgate systems with different motherboards, which makes for potential confusion as a technical reference. If you need help, Northgate offers assistance 24 hours a day, seven days a week via an 800 number. Its mail-order warranty covers parts and labor for a year. On-site service is available from NCR; extending it beyond the first year at the time of purchase costs an extra 5 percent of the system cost.

—*William Bettini*

**FACT FILE**



**Northgate 386SX/25**
Northgate Computer Systems Inc., 7075 Flying Cloud Dr., Eden Prairie, MN 55344; 800-548-1993; fax, 612-943-6965.
**List price (tested configuration):** $2,049.
**Memory and processor RAM cache:** 4MB 80-ns. SIMMs.
**Disk drives and controller:** Toshiba 19-ms. 106MB IDE hard disk, 1.2MB and 1.44MB floppy disk drives.
**Display:** United Solutions 800-by-600 adapter with 256K RAM. Panasonic PanaSync 14-inch monitor.
**Monitor refresh rate:** 60 Hz.
**Software:** DOS 5.0, Microsoft Windows 3.0 (with Microsoft Mouse), *QA Plus* 4.52.

CIRCLE 489 ON READER SERVICE CARD

**SIRIUS SYSTEMS TECHNOLOGY INC.**

## SST 386SX25MC

**SST 386SX25MC, $1,800**

As with the other tested machines that scored well on our video benchmark test, the SST 386SX25MC, from Sirius Systems Technology, is potentially a strong performer for multimedia and graphical desktop environments. What holds it back is a relatively slow hard disk, though SST supplies a software disk cache to speed up the system.

At $1,800, the SST 386SX25MC we received came configured with a TMC Research motherboard, a Chips and Technologies chip set, 4MB of 70-nanosecond DRAM (expandable to 16MB), 64K of 20-ns. direct-mapped processor RAM cache, and a Cyrix FasMath 83S87-25 math coprocessor.

**PC LABS' BENCHMARK TESTS 6.0**

**SST 386SX25MC**

| Test Scores | | Systems in this review | | |
|---|---|---|---|---|
| | | Worst | Best | Average |
| Processor | 130 | 115 | 132 | 125 |
| Memory | 3,358 | 1,946 | 3,358 | 2,776 |
| Disk | 148 | 143 | 394 | 226 |
| Video | 3,977 | 1,445 | 3,977 | 3,202 |
| Windows Graphics | 1,749 | 694 | 2,091 | 1,559 |

**In Short:** The cached TMC Research motherboard brought the $1,800 SST 386SX25MC to first place on the memory benchmark test and second on the processor test. The PC took another first for video and placed seventh for Windows Graphics testing, but its disk performed somewhat below average compared with other uncached hard disks.

The RAM speed and 64K of processor RAM cache boosted the SST 386SX-25MC's performance on PC Magazine Labs' processor and memory benchmark tests. Bundled with the system, in addition to DOS 5.0 or 4.01, are *Cache 86* (The Aldridge Company's software disk cache), *TREE 86* (a mouse-driven DOS shell), and *PreCursor* (a menuing system).

The machine's five bays consist of three 5.25-inch half-heights and two vertical 3.5-inch slimlines, all of which are front accessible. Chinon 1.2MB and 1.44MB floppy disk drives occupied the expected two; a 20-millisecond 130MB Seagate ST-3144A IDE hard disk occupied the second 3.5-inch bay. Without the cache, this hard disk turned in one of the slowest disk performance times of the group.

Of the motherboard's eight 16-bit ISA slots, one held a video adapter and another a multifunction board, which combined I/O functions with interfaces that could accept two hard disks and four floppy disk drives. All the slots can take full-length boards except for the two closest to the power supply; these are partially blocked by the vertical drive bays and have room for only half-length boards.

The SST 386SX25MC's video subsystem consists of STB's PowerGraph Super VGA adapter with a Tseng ET4000AX chip set, 1MB of 80-ns. RAM, and a CTX CVP-5468NI Super VGA

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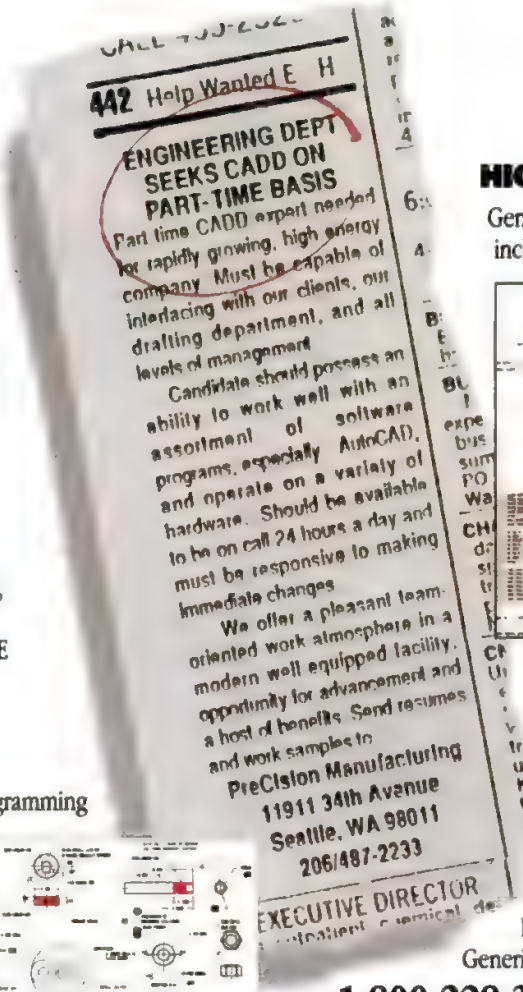
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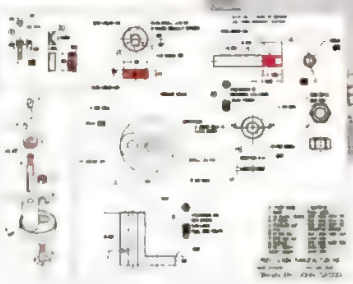

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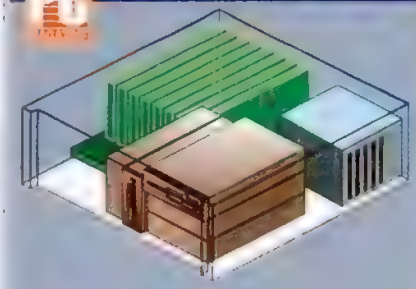

**SST 386SX25MC**
Sirius Systems Technology Inc., 4344 Young St., Pasadena, TX 77504; 800-424-0724, 713-946-0724; fax, 713-946-5451.
**List price (tested configuration):** $1,800.
**Memory and processor RAM cache:** 4MB 70-ns. SIMMs, 64K cache.
**Disk drives and controller:** Seagate 20-ms. 130MB IDE hard disk, 1.2MB and 1.44MB floppy disk drives.
**Display:** PowerGraph 1,024-by-768 adapter with 1MB RAM, CTX 14-inch monitor.
**Monitor refresh rate:** 72 Hz.
**Software:** DOS 5.0, *PreCursor.*

CIRCLE 476 ON READER SERVICE CARD

monitor. The PowerGraph adapter, which supports 256 simultaneous colors at 800-by-600 and 1,024-by-768 resolutions, placed first on our video test and sixth on our Windows Graphics test. The CTX monitor, refreshed at a rate that varies from 50 to 90 Hz, can display 256 simultaneous colors at resolutions up to 1,024 by 768 noninterlaced. The company also offers a Sierra Hi-Color DAC board (32,768 colors at an 800-by-600 noninterlaced resolution) for $50 more.

*The Twinhead Superset 590/25C's system board design integrates video, IDE, and I/O ports.*

The SST 386SX25MC comes with a free one-year on-site warranty that includes parts and labor and on-site service from Idea Servcom. For an extra $200, you have the option to extend this warranty. Indexed to include all of the system's components, the unit's documentation serves as a good technical reference for both the experienced and the novice user. Toll-free technical support is available weekdays from 8:00 to 6:00 C.S.T.—*William Bettini*

**TWINHEAD CORP.**

## Twinhead Superset 590/25C

**Twinhead Superset 590/25C, $1,989**

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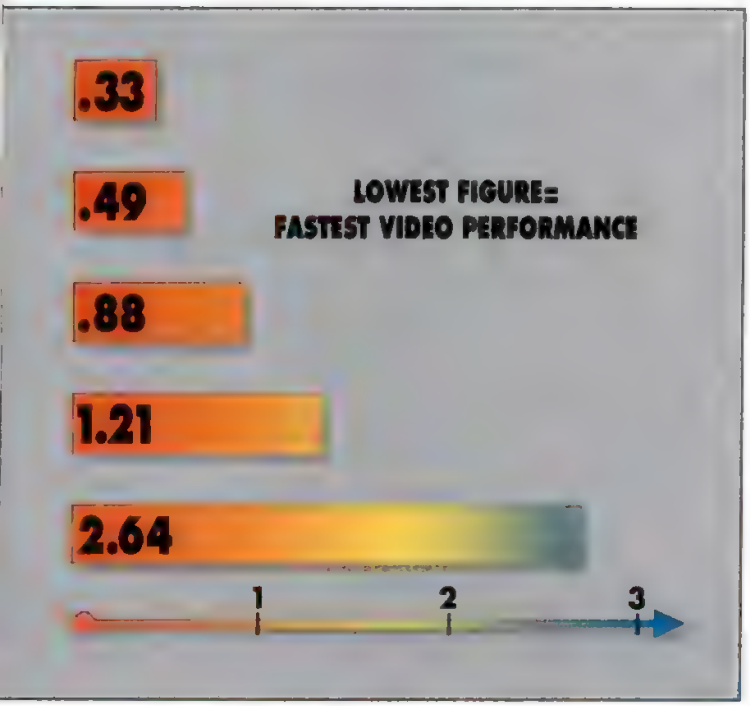


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**PC LABS' BENCHMARK TESTS 6.0**

**Twinhead Superset 590/25C**

| Test Scores | | Systems in this review | | |
|---|---|---|---|---|
| | | Worst | Best | Average |
| Processor | 132 | 115 | 132 | 125 |
| Memory | 3,256 | 1,946 | 3,358 | 2,776 |
| Disk | 169 | 143 | 394 | 226 |
| Video | 1,445 | 1,445 | 3,977 | 3,202 |
| Windows Graphics | 1,496 | 694 | 2,091 | 1,559 |

**In Short:** Twinhead put its own motherboard into its $1,989 Superset 590/25C. The only one in this test group to have a 16K four-way set-associative cache, it placed first on our processor benchmark test. Its disk performance was also good (compared with other uncached disks), although its video and Windows Graphics scores were low.

saving Twinhead motherboard integrates the video controller, IDE interface, and I/O ports, yet the vendor settled for packaging a 20-MHz Intel 82396SX caching controller souped up to 25 MHz through the system clock—a risky practice that technically voids Intel's warranty on the chip even though Twinhead supplies all service.

And while this 16K four-way set-associative processor RAM cache helped the system garner the top processor score and exceptional memory results on our tests, the product's video scores were among the lowest of the systems reviewed.

The Superset 590/25C's motherboard has a T bar that holds four 16-bit ISA slots horizontally. This configuration also held an Intel/VLSI chip set, an Award ROM BIOS, and—for our test configuration—1MB of 70-nanosecond DIP RAM and 4MB more in 60-ns. SIMM banks. To expand RAM to the unit's 17MB maximum, you have to replace the four 1MB modules with 4MB modules.

Our tested system's hard disk, a 19-millisecond 105MB IDE Conner CP-30104, placed squarely in the middle on our disk test, compared with other uncached disks. One 5.25-inch half-height and two 5.25-inch slimlines make up the three accessible bays; one 3.5-inch half-height bay is internal. You can easily remove the 1.2MB Canon and the 1.44MB TEAC floppy disk drives by unhooking the snaps securing them.

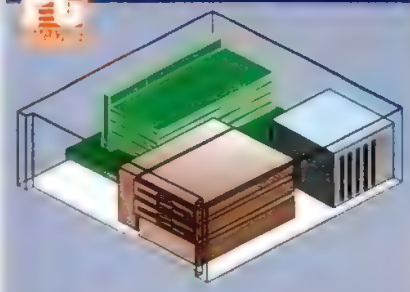
The motherboard's integrated video board comes with 1MB of RAM and has a Trident chip set that allows the adapter to support 256 simultaneous colors at a 1,024-by-768 resolution. Accompanying it was a 14-inch Relisys Model RE9514 monitor that supports an 800-by-600 noninterlaced resolution at a 60-Hz refresh rate. If you plan to use the 1,024-by-768 resolution regularly, you should look for a monitor that has a noninterlaced display at that resolution.

*Wang's motherboard holds up to eight 1MB SIMMs in sockets and another 8MB on a proprietary card.*

The Superset 590/25C's video score was poor, and a peculiarity arose during our Windows Graphics test: It performed this test in 8-bit mode. Twinhead is aware of the problem and was trying to resolve it when we went to press.

In addition to DOS 5.0, Twinhead bundles Microsoft Windows 3.0 and *TopCat Memory Management* with every system. Documentation was comprehensive and explained all available options and features, including technical specifications such as motherboard jumper settings. Twinhead's warranty includes one year on all parts and labor and free on-site service from TRW. Toll-free technical support is available weekdays from 6:00 to 6:00 P.S.T.—*Mario Baldasserini*

**FACT FILE**



**Twinhead Superset 590/25C**
Twinhead Corp., 1537 Centre Pointe Dr., Milpitas, CA 95035; 800-545-8946, 408-945-0808; fax, 408-945-1080.
**List price (tested configuration):** $1,989.
**Memory and processor RAM cache:** 4MB 60-ns. and 70-ns. SIMMs, 16K cache.
**Disk drives and controller:** Conner 19-ms. 120MB IDE hard disk, 1.2MB and 1.44MB floppy disk drives.
**Display:** Trident 1,024-by-768 adapter with 1MB RAM, Relisys 14-inch monitor.
**Monitor refresh rate:** 60 Hz.
**Software:** DOS 5.0, Microsoft Windows 3.0, *TopCat Memory Management.*

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**WANG LABORATORIES INC.**

## Wang PC361/25SC

**Wang PC361/25SC, $4,469**

The most outstanding feature of the Wang PC361/25SC is the extent to which its components are integrated onto the motherboard and controllable through software. Wang Laboratories also offers security protection in the form of an entry lock, two levels of password protection, and the ability to turn off ports and drives.

Our $4,469 tested unit had a rugged small-footprint construction that limited the number of its drive bays to three 5.25-inch half-heights: two of these were horizontal and accessible from the front; the third, situated vertically, was internal. The 1.2MB and 1.44MB floppy disk drives bear the Wang logo. The 126MB 18-millisecond IDE hard disk, a Seagate ST-1144A, scored in middle of the pack on PC Magazine Labs' disk test.

Wang makes both the motherboard, which bears a Chips and Technologies chip set, and the BIOS. Connectors for video, IDE, and two floppy disk drives, plus one parallel, two serial, and a PS/2-style mouse port, are integrated into the motherboard, leaving empty all six of its slots (one 8-bit and five 16-bit).

The Wang was the only system in the test group to have 64K of 25-nanosecond two-way set-associative cache and an Austek A38202SX cache controller. Neither RAM speed nor cache size, however, raised its processor and memory scores much above average. Our test sys-

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**PC LABS' BENCHMARK TESTS 8.0**

**Wang PC361/25SC**

| Test Scores | | Systems in this review | | |
|---|---|---|---|---|
| | | Worst | Best | Average |
| Processor | 128 | 115 | 132 | 125 |
| Memory | 2,850 | 1,946 | 3,358 | 2,776 |
| Disk | 170 | 143 | 394 | 226 |
| Video | 2,230 | 1,445 | 3,977 | 3,202 |
| Windows Graphics | 2,091 | 694 | 2,091 | 1,559 |

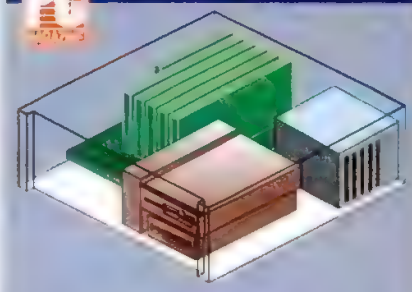
**In Short:** The Wang PC361/25SC's integrated video subsystem won it first place on the Windows Graphics benchmark test, but this PC did poorly on the video test. Its processor and memory scores were about average, and its disk score was slightly above average compared with other uncached hard disks. The biggest stumbling block for anyone not already committed to Wang's service and support is the unit's $4,469 price.

tem had 4MB of 60-nanosecond DRAM. Though the Wang motherboard does not accept 4MB SIMMs, it can hold up to eight 1MB SIMM banks in integrated sockets. A proprietary 16-bit card expands the system RAM to 16MB.

Wang makes both the video adapter and monitor for this system. The Wang PC361/25SC's video adapter carries a Chips and Technologies chip set and supports 256 simultaneous colors at a 640-by-480 resolution. Despite having only 512K of video RAM, this PC placed first on our Windows Graphics test, most likely because the video RAM was so highly integrated onto the motherboard, but also possibly because of the driver support for the video chip set. Surprisingly, its video test score was one of the lowest. The monitor is a low-radiation Wang 1414 Super VGA unit that has a refresh rate of 60 Hz at a 640-by-480 resolution.

Wang offers a one-year warranty on parts and labor backed by technical support that is toll-free but not free of charge; the charge depends on the level of support you want. Technical support operates seven days a week from 7:00 A.M. to 2:00 A.M. E.S.T. You can ship the unit to Wang at your own cost or pay Wang $14 a month for on-site service. The accompanying documentation was complete and made an acceptable technical reference.
—*William Bettini* ■

**FACT FILE**



**Wang PC361/25SC**
Wang Laboratories Inc., One Industrial Ave., Lowell, MA 01851; 800-835-9264, 508-459-5000; fax, 508-967-3825.
**List price (tested configuration):** $4,469.
**Memory and processor RAM cache:** 4MB 70-ns. SIMMs, 64K cache.
**Disk drives and controller:** Seagate 18-ms. 126MB IDE hard disk, 1.2MB and 1.44MB floppy disk drives.
**Display:** Wang Super VGA adapter with 512K RAM, Wang VGA 14-inch monitor.
**Monitor refresh rate:** 60 Hz.
**Software:** DOS 5.0.

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*Julie Cohen is an associate editor of* PC Magazine. *William Bettini is a PC Labs senior technical analyst. Mario Baldasserini is a PC Labs technical analyst.*

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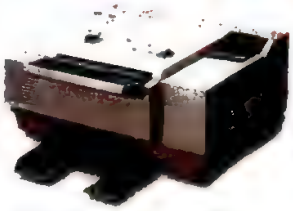

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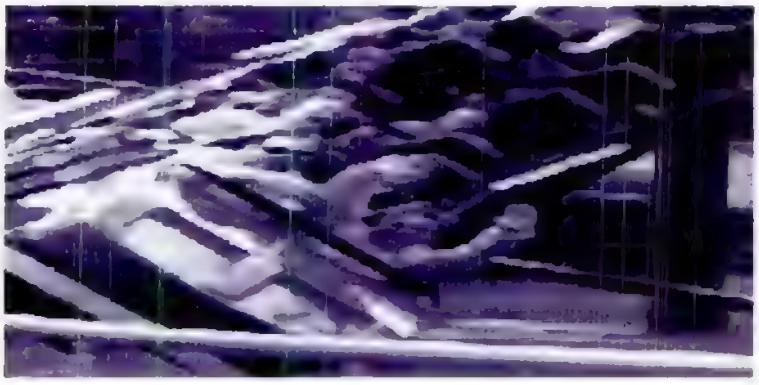
PhoenixPage

## Something Lossed, Something Gained

# Image Compression For PC Graphics

by Lori Grunin Exciting new graphical technologies such as photo-quality color imaging, full-motion video, and video teleconferencing are coming to the PC. The vast quantities of data they generate make image compression one of the hot technologies to watch this year. Here's a guide to the players.



Barring any unforeseen technological leaps that might increase the bandwidth of the PC's I/O bus, data-compression technology seems to hold the key to dramatic developments in PC-based graphics, audio, and animation. Applications in publishing, image editing and archiving, presentation making, and entertainment are starting to flood the market, but the

huge data files generated by digital sounds and pictures are a real stumbling block. Full-color (24-bit) image files make today's high-capacity hard disks look puny, and moving data streams of this magnitude across networks or over phone lines is simply infeasible. The most viable solution seems to be to find ways to cram at least some of the information into less digital space.

Data-compression utilities (such as the ones we reviewed in the October 15, 1991, issue of *PC Magazine*) have been around for a while. These work fine for squeezing typical text and data files, but they aren't very effective for full-color images. They use techniques known as *lossless* methods—LZW, PackBits, and run length encoding (RLE), for example—which work by eliminating redundancy. A normal text file, for instance, consists of about 50 different characters that appear in highly repetitive patterns. It's a relatively simple programming feat to find shorthand ways to represent these patterns and thus reduce file size. Lossless methods are also useful for compressing black-and-white and most gray-scale images, since they too contain high levels of redundancy.

*Lossy compression capitalizes on our nonlinear perception of color and the brain's capacity to "fill in the blanks."*

Bitmapped color images, however, vary greatly in their levels of redundancy. The more colors the technology is able to work with (the greater the *color depth*), the more colors are likely to appear in the image, and the less likely it is that any two adjacent pixels will be identical. A digital rendition of a photographic-quality continuous-tone (*contone*) image can contain up to 16.8 million colors; with that many possible matches, it's difficult to find redundancy. So the larger and more complex the graphics file, the more difficult it is to compress. After all, 24MB graphics files are not atypical. And the 2:1 ratio offered by lossless compression techniques just doesn't cut it when you need to store hundreds of huge files in an image database—or send even one such file down to a network printer.

#### FLLNG N TH BLNKS

It may have puzzled you for a moment, but you were probably able to read the heading above this paragraph in spite of the missing vowels: We compressed it almost 20 percent, taking advantage of the fact that your brain doesn't need the complete information set (the correct spelling) in order to decipher it. To compress the phrase further, we could have thrown out the second *L* in "FLLNG" and dropped the spaces between the words to achieve a compression rate of almost 40 percent. You would still be able to understand the meaning of the phrase but would probably find it visually disconcerting. Furthermore, the more you throw away, the more ambiguous your decoding of the phrase gets and the more brainpower it requires to understand. There you have, in a nutshell, the pros and cons of *lossy* image compression—methods that sacrifice information for compactness. Current techniques for compressing contone still and moving images rest on this principle; a variety of acronymic technologies—DCT, FIF, JPEG, WIC—are now capitalizing on human nonlinear perception of color and the brain's capacity to "fill in the blanks" to achieve higher compression rates than ever before.

Lossy compression is not a new idea. As a matter of fact, some people consider physically shrinking the image—say, from full-screen to quarter-screen—a method of lossy compression, since it involves discarding "unnecessary" resolution information. But shrinking an image makes it more difficult to make out details. Similarly, reducing the frame rate of a video from 30 to 15 frames per second (fps) "compresses" the amount of information, but it has an adverse effect on the perception of motion.

#### COLOR SPACE: THE NEXT FRONTIER?

To explain lossy compression schemes fully, we first need to overturn a bit of conventional PC wisdom. It is semi-axiomatic that you can improve the quality of a digitized color image more by adding colors than by adding pixels. But that statement only holds true when you describe colors in specific ways.

Systems for describing color mathematically have been developed for a variety of reasons, not the least of which is that computers only know how to deal with numbers, and everyone who has worked with color on the desktop has become pretty comfortable with specifying colors in terms of their red, green, and blue components. Thus, if you want a reddish gray, you can tell an application that you want 34 red, 33 green, and 33 blue; the numbers indicate what proportion of each color to add out of an 8-bit scale of 0 to 255.

All the colors that you can create using proportions of red, green, and blue define the RGB color space. But different uses of color occasionally require the use of different color spaces. The most important of these spaces for our purposes are the (nonacronymic) YIQ and YUV spaces, which consist of one *luminance* (brightness or luma) coordinate—the *y*—and two *chrominance* (color or chroma) coordinates.

These two spaces were invented by television broadcasters in order to support color without losing compatibility with black-and-white TVs. They found that by defining *color saturation* as the amplitude of a wave and *hue* as the wave's phase relative to some reference, they could add the new wave to a low-frequency, luminance-only (black-and-white) signal to create a composite signal that generates a color picture.

Reducing the number of colors in an image is an obvious method of shrinking a file. But if you've ever seen the difference between a 256-color and a 16-color version of the same image, you know that reducing the number of available colors takes away detail. That's because in the RGB space, specifying a pixel's color is the only way to describe it, and it takes all three values (red, green, and blue) to describe any color. Take away that information and the pixel becomes indistinguishable from its neighbor.

In luminance/chrominance spaces, however, the image detail is independent of the color detail: The most important information in the YUV/YIQ spaces resides in the luminance channel. Black-and-white TV, which is composed solely of luminance information, reproduces highly detailed images. Furthermore, it only requires 8 data bits (256 levels of gray) in order to store all the visually perceptible resolution information.

Thus, by using the YUV or YIQ space

## GLOSSARY: Image Compression

**artifact** Any undesired visible change in an image that results from processing that image.

**asymmetrical compression** A method in which the decompression process is not the reverse of the compression process. With asymmetrical algorithms, compression usually takes longer than decompression.

**bandwidth** The amount of data a channel can hold while transferring the data from its source to its destination.

**blocking** The unwanted visibility of blocks of pixels in an image.

**chrominance** Color; also called *chroma.*

**color depth** The number of bits available for describing a color. For example, with 256 colors, each color has a bit depth of 8, because $2^8 = 256$.

**color shift** The unwanted changing of colors caused by excessive color reduction or alteration.

**color space** The set of all colors that can be described using a given set of primaries. For example, the RGB color space comprises all the colors that can be created out of the colors red, green, and blue.

**contone** Abbreviation for *continuous tone,* referring to a photographic-quality image.

**DCT (discrete cosine transform)** A mathematical process that transforms image data into a form better suited to lossy compression.

**forward prediction** A method of motion compensation in which a compressed frame of video is constructed based on the differences between two consecutive frames.

**fractal** Any image or object that can be constructed using an iterative mathematical formula.

**interframe compression** Compacting a video clip by discarding the redundant data between two or more frames.

**interpolation** A method of motion compensation in which a compressed frame of video is constructed based on the differences between one frame and both previous and subsequent frames.

**intraframe compression** The term used for still-image compression when used as a part of video compression.

**lossless compression** A compression method that merely rearranges data in order to compact it.

**lossy compression** A compression method in which some data is lost during the compression process.

**luminance** Brightness; also called *luma.*

**motion compensation** The use of interframe compression methods, such as forward prediction and interpolation, that are especially designed to minimize visual errors.

**quantization** Mapping a continuous set of values to a discrete set.

**reference frames** The non-motion-compensated frames in a clip of compressed video; also referred to as *intraframes.*

**smearing** The unwanted blurring of edges in a compressed image.

**symmetrical compression** A method in which decompression is the reverse of the compression process. ■

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instead of RGB—which requires a relatively simple mathematical transformation from one to the other—you can compress more information in the two chroma channels than in the luma channel without losing nearly as much visible detail. So translating an image into YUV or YIQ is the first step any lossy compression algorithm makes before the real work begins.

### JPEG: THE STANDARD FOR STILLS

For useful lossy compression to succeed, the implementations need to be nonproprietary. After all, we need to be able to exchange files with each other and among a variety of applications. That's where JPEG comes in.

The Joint Photographic Experts Group or *JPEG* compression standard is based on a generic mathematical function known as the *forward discrete cosine transform*, or *forward DCT*. In Baseline Sequential JPEG (the most popular of the several extant flavors of JPEG), a forward DCT is performed on 8-pixel-by-8-pixel blocks in each of the three color-information channels. The DCT doesn't actually compress the image, but it translates the image data into a format that is more amenable to compression. Normally, every pixel in an image must be defined with three pieces of information: two coordinates that tell you where in the image the pixel lies and another that tells you the pixel's color. This three-dimensional way of describing each pixel is called the *spatial representation* of the image. A forward DCT converts this three-dimensional spatial representation into a two-dimensional frequency-based *spectral representation*.

In addition to reducing the number of dimensions used to describe the image, the resulting matrix is comprised of values that break down the colors in the image into frequencies ranging from the

## COMPRESSED IMAGES: Paying the Visual Price

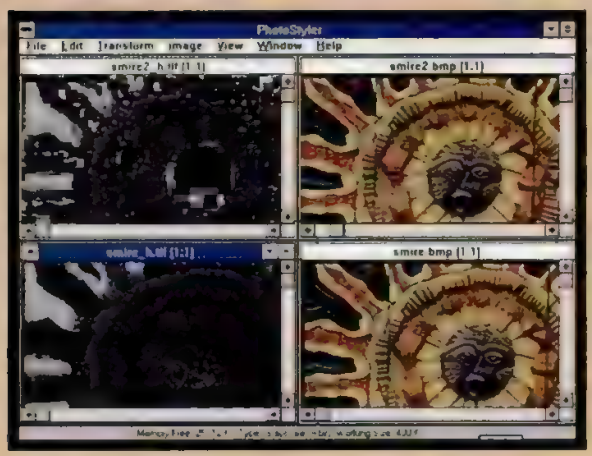
In the course of researching this story, we noted some interesting features of JPEG and fractal compression technologies, which we present here. We performed all JPEG compression with a C-Cube–based board from Opta running in conjunction with the same company's MonaLisa 24-bit graphics adapter. We generated fractal-compressed files using Iterated Systems' Fractal Compression board, then viewed them using the MonaLisa adapter. We installed both boards in a Compaq Deskpro 386/25e equipped with 8MB RAM and a 300MB hard disk.

**SPOTTING JPEG COMPRESSION ARTIFACTS**

**This screenshot shows the color shift and blocking artifacts that arise under extreme compression. The original 1.2MB file on the left was compressed at 43:1 using JPEG at a Q-factor of 255—the greatest possible extreme—to produce the 27K file on the right.**

**Although the artifacts may be masked by distortions that were introduced during image processing and printing, you can probably see the color shift and blocking in the face; the center of the face has shifted entirely to shades of gray. In addition, there is smearing in the broad yellow and red areas.**

**This image only squeezed down to 27K at maximum compression, but higher rates may be possible with other images. Less detailed images with larger areas of solid or similar colors will probably compress further.**




**WHERE JPEG SQUEEZES MOST**

**The top-right corner of this screen shows the original 1.2MB image. The image below it is the same file compressed to 44K, the result of 26:1 compression at a Q-factor of 125. We separated both of the files into their hue, saturation, and brightness components; the images on the left side of the screen show the hue channels for the corresponding images.**

**By comparing the hue channels from the two images, you can clearly see how much color information has been removed from each image by replacing gradual hue changes within a DCT block with fewer values.**

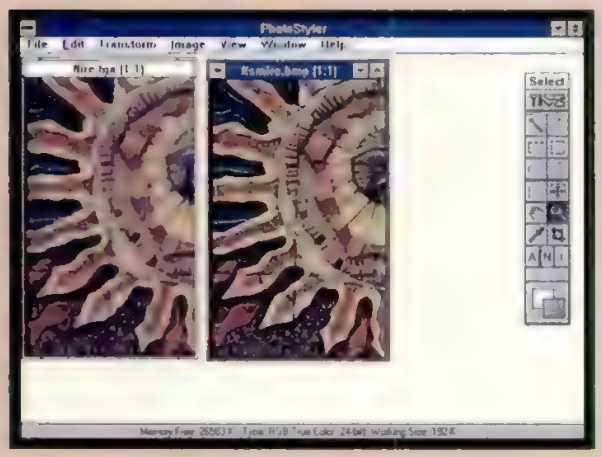
very low, in the upper-left-hand corner of the matrix, to the very high, in the lower right. Since the most common frequencies in an image are the low-frequency components, the value in the upper-left corner—the *DC coefficient*—indicates the dominant color value in the pixel block.

This matrix also gives you the information you need to discard color data whose frequencies lie above some user- and programmer-definable thresholds. Of course, the more color data you discard, the more the quality of the image degrades; the thresholds you choose affect the rate at which this degradation occurs. The programmer determines the rate of degradation via the selection of a *quantization matrix,* which maps the DCT values to a more granular discrete set.

In most implementations, the user can control the number of ranges, referred to as the *Q-factor;* the more ranges you have, the greater the variety of colors, but the less compression you can achieve. The more values you can map to 0, the more compact the file. The JPEG algorithm allows quantizing into as many as 256 separate, equal-size ranges (there are 8 bits to store this information).

While the number of quantization ranges is fixed by the JPEG standard, the choice of values in the quantization matrices is up to the person who is implementing it. Thus, the selection of quantization tables helps differentiate one JPEG implementation from another—one of the few contributions a vendor can make to image quality in an otherwise rigidly defined operation. For instance, mapping the high-frequency values to a small range incurs less of a quality penalty than doing the same with the middle frequencies, because most humans have more trouble differentiating among high-frequency colors (blues) than middle- or lower-frequency colors (especially greens).

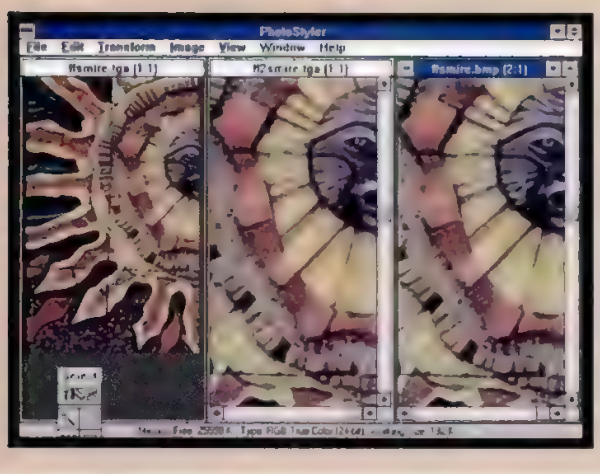
Keep in mind that in lossy image compression, "compression ratio" is a moving target. Since the software is making image-dependent decisions about how much data it needs to preserve, two different images maximally compressed using the same algorithm can result in dramatically different compression ratios. The amount of compression you can get out of an image depends heavily on the number of colors as well as their distribution throughout the image, so, for example, an image of a checkerboard can compress further than the same-size image of a mosaic. ■




**SPOTTING FRACTAL COMPRESSION ARTIFACTS**
**The image on the right side of the screen is the original 192K file. The one on the left is compressed down to 4K (about 47:1) using Iterated Systems' Fractal Compression board.**

**Extreme compression with the fractal algorithm yields images with relatively little color shift and some slightly perceptible blocking, but with large amounts of smearing reminiscent of impressionist paintings.**

**While these types of artifacts would be very visible in an image with a lot of hard edges, images with large areas of unchanging color would not be as adversely affected.**




**SCALABLE IMAGES FROM FRACTALS**
**One of the intriguing features of fractal compression is its resolution-independence. Special decompression software can mathematically scale the image to a higher resolution without introducing bitmap-specific artifacts such as pixelation.**
**The image on the left is the 192K original; on the right is the same file compressed to 18K (about 11:1) and zoomed in to double the size using conventional methods. The center image was created by decompressing the file to double the original size and saving it as a .TGA file. By comparison with the double-decompressed version, the image on the right shows more pixelation as well as striping effects on the high-contrast edges.**

Another way in which a vendor can differentiate its product from the rest of the crowd is by extending the Baseline technology. For example, Storm Technology's PicturePress, a Macintosh-only compression product that uses an extension the company calls JPEG++, allows you to compress pieces of an image to different levels selectively.

The DCT and the quantization process constitute the essence of JPEG. The last step of the process consists of using two lossless compression methods—Differential Pulse Code Modulation (DPCM) and Huffman coding—to encode the lossy-compressed data. To decompress the JPEG-compressed image, you merely reverse the process.

*Microsoft has signed deals with Xing and Iterated Systems to support JPEG and fractal compression in future products.*

JPEG represents a great step in the use and acceptance of lossy compression. But it's not perfect. The two most egregious shortcomings of JPEG include *blocking*, the undesired visibility of the boundaries between those all-important pixel blocks, and *color shift*, changes in colors stemming from too few quantization ranges. Furthermore, since the DCT concentrates the image information into the low-frequency ranges, sharp edges, which usually consist of high-frequency jumps between two colors, tend to blur or alias. (See the sidebar "Compressed Images: Paying the Visual Price.")

Whether or not these problems should deter you from using JPEG compression depends on your application. The more important detail and color accuracy are, the more risky it is to use JPEG.

#### STANDARDIZING THE STANDARD

The DCT has been in use for years. But like the overnight show-biz success who pounded the pavement for a decade, it has suddenly become one of the most popular techniques in compression circles, in large part because the Comite Consultatif International Telegraphique et Telephonique (CCITT) and International Standards Organization (ISO) have chosen to adopt JPEG as a standard (final ratification is due in May 1992). Merit aside, this impending acceptance by standards organizations and the relative ease of implementation seem to be the keys to JPEG's widespread success.

JPEG does face some compatibility problems, however, because the standard specifies only the compression methods involved, not the format of the output file. To circumvent possible problems arising from this loophole, most of the vendors developing JPEG products have been exchanging examples of their output files to ensure interchangeability. Furthermore, two companies, C-Cube Microsystems and Xing Technology Corp., are developing a Scalable Compression Architecture (SCA), an intermediary API that sits between applications and JPEG hardware or software, much as Windows sits between *Microsoft Excel* and your LaserJet driver.

#### IMPLEMENTING JPEG: THE HARD AND THE SOFT OF IT

Since all computations are performed on a small block of pixels and the algorithms involved are relatively simple, non-time-critical JPEG compression can take place completely in software. Directly reading and writing compressed files from within applications seems to be the best software solution. Although as of this writing no major applications directly support JPEG compression, several software-only JPEG utilities have emerged to fill the current void. For example, VIC Technology's *Picture Packer* ($79; Torrance, California), Xing Technology's *VT-Compress* ($179; Arroyo Grande, California), and ITR's *ITR Vision Software* ($295; Pembroke Park, Florida) will allow you to compress and decompress most contone TIFF and Targa files in less than a minute. And Microsoft has signed a deal with Xing to license its compression software for use in unspecified future products. For those who need JPEG compression as well as conversion of bitmapped graphics files from other hardware platforms—including Silicon Graphics and Sun—Handmade Software's *Image Alchemy*, Version 1.5 ($79.95; Los Gatos, California), offers a unique solution.

Most of the software-only JPEG compression products don't offer users the full range of quantization, but instead allow them to specify the desired quality of the compressed image or, say, to choose a level from 1 to 10. Since the amount of compression (and therefore degradation) you'll get from a given Q-factor varies according to the image, this can greatly simplify the compression process. But the trade-off is flexibility.

Direct support of JPEG within existing file formats is on the horizon. Aldus is thinking of incorporating it into a specification of its TIFF format, usually referred to as JPEG-TIFF. And PostScript Level 2 has the capability of decompressing JPEG files during rasterization; this means that theoretically you may be able to send a *PageMaker* file with an embedded JPEG-compressed TIFF file to a PostScript Level 2–compatible printer, and the printer could decompress the file.

JPEG is a *symmetrical* algorithm: The decompression process is the exact reverse of the compression process. You can therefore speed up any of these software operations more or less equally by using some sort of hardware.

Hardware JPEG support currently takes several forms. One solution is an adapter with a digital signal processor (DSP) that performs the mathematical calculations. A DSP buys you a compression/decompression speed increase to about 3 seconds per image. Examples in this category are the DSP-board option for VIC's *PicturePacker* ($595 for the bundle) and Optibase's single-DSP Optibase 100 ($995) and double-DSP Optibase 500 ($1,995; Canoga Park, California).

You may also want to opt for a more powerful hardware solution if you're dealing with really large images, especially ones greater than 8.5 by 11 inches. Most of the compression boards on the market as of this writing use C-Cube's CL550 processor, a JPEG-specific *application-specific integrated circuit* (ASIC) chip.

For still-image applications, for instance, Opta offers a CL550-based add-in card to work in conjunction with its 24-bit MonaLisa graphics adapter ($1,995; for a review of the graphics adapter, see the January 14, 1992, issue). New Media Graphics' Super Still-Frame Compression Board is another standalone product ($995; Billerica, Massachusetts).

Both the C-Cube and LSI Logic chips are fixed-function implementations, however; they can only be used for JPEG compression. IIT's Vision Processor and

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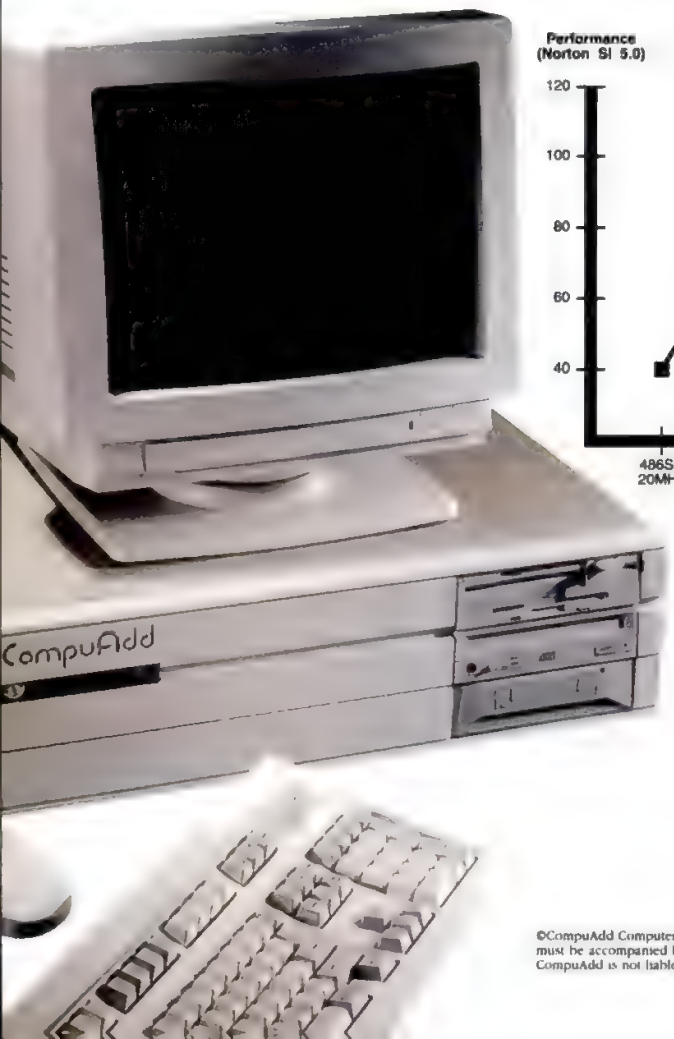


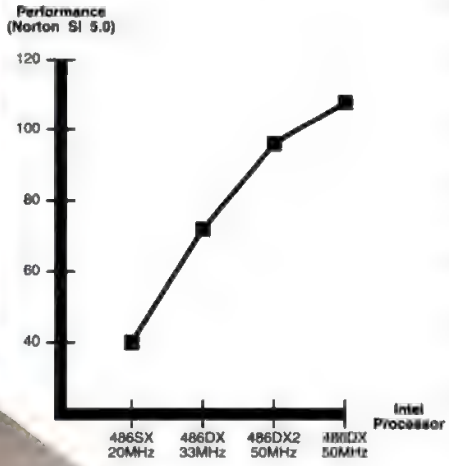


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Intel's i750 chip are programmable processors that can be used for both still- and motion-video compression; they'll pop up again later when we discuss motion-video compression.

#### FRACTALS FOR THE MASSES

While JPEG is probably the best-known and most commonly implemented of the image-compression methods, it's not alone in its market. Fractal image compression, for instance, has been in the works at Iterated Systems for almost as long as others have been developing JPEG solutions. Fractal compression (or FIF, for the Fractal Image Format) looks for all the repetitive patterns in an image sufficient to reconstruct the original. Rather than deciding in advance which types of data are important and throwing away the rest, the fractal algorithm discards data along the way as it fails to find matches.

Unlike in JPEG, where you specify the desired quality of the compressed image, you begin a fractal compression session by specifying the size of the compressed file. An Intel i960 processor on the fractal compression board then converts the image to YUV, averages colors across blocks of 4 pixels, and breaks the image into large chunks called *domain blocks*. A domain block is in turn broken down into smaller and smaller blocks, each of which is passed to one of the eight on-board ASICs.

The ASICs do all the pattern-searching work. Exact matches are, of course, pretty difficult to find, and you wouldn't get much compression that way. But the fractal engine searches for patterns that can be matched via a mathematical transformation known as an *affine map*. Simply put, this means that two patterns are considered the same as long as one can be stretched, squeezed, or rotated into looking like the other. The process continues until the image is approximately the size initially specified by the user.

As you might guess, this is a computationally intensive process. It is also an *asymmetrical* one: Compression takes longer than decompression, and no decompression hardware is necessary. According to Iterated Systems, a software-only compression implementation on a 33-MHz 486-based PC would achieve the same speed provided by the add-in board, versions of which range in cost from $1,995 to $8,850. The company will be coming out with a $200 software-only version in early 1992. And Microsoft has also licensed the fractal compression technology for use in future multimedia-harnessing products.

The unique benefit of the fractal method is scalability. Because the FIF views patterns rather than pixels as the fundamental blocks from which an image is constructed, it can double the size of an image by mathematically scaling the pattern instead of just inserting extra pixels. (See the sidebar "Compressed Images: Paying the Visual Price.)

Also, in contrast to DCT-based compression schemes, in which improvements are restricted to tweaking of the quantization matrix and perhaps some preprocessing on the image, fractal compression can be improved via mathematical refinement and more computational horsepower. The current incarnation of the algorithm can shrink images down to as little as 5K but is prone to blocking (as with JPEG) and smearing, which looks like anti-aliasing gone awry. Furthermore, fractal compression implementations seem expensive and slow when compared with JPEG. But fractal compression is also based on newer, more complex technology than JPEG.

> *Playing back digitized video at the standard rate of 30 frames per second requires substantial processing muscle.*

#### CATCHING A WAVELET

The final entrant—for now—in the still-image compression game also emerges from the hallowed halls of higher mathematics, although it resembles JPEG more than fractal technology.

Wavelet Image Compression (WIC) is Aware Inc.'s response to some of the limitations of the DCT algorithm. The DCT approximates a frequency by converting it to sums of cosine waves. But cosines are regular, repeating functions, and as mentioned earlier, the DCT tends to mask sudden changes in frequencies (such as a black pixel next to a white pixel) and to subdue high-frequency colors. This causes blurriness around what should be distinct edges, as well as perceived color shifts.

WIC essentially follows the same principles as a DCT, but decomposes the color wavelengths into two sequences—one of the high-frequency data, the other of the low-frequency data—in a process known as a Discrete Wavelet Transform (DWT). These more jagged, irregular wavelet functions, which have odd-sounding names such as Hat, Daubechies 6, and City, are theoretically better at preserving edges, because they capture rather than discard the high-frequency data. The software performs about 5 DWTs in succession, iterating the image down to its most basic elements.

WIC is still too new to have made much headway in the market or to let us draw any real conclusions about its quality. Aware plans to ship the first Wavelet Transform Processor—a 30-MHz chip that performs both compression and decompression—in the first quarter of 1992.

#### COMPRESSING MOVING IMAGES

Time plays a much more critical role in video compression and decompression than with still images. Video achieves its apparent smoothness of motion by sending 30 still images to the screen every second. To play back compressed images at the standard video rate of 30 frames per second, then, you need a system that can decompress images in $^1/_{30}$ second or less. This requires substantial processing muscle. For instance, C-Cube's CL550 chip comes in three speeds, 10, 30, and 35 MHz, but only a board built around the 35-MHz version will attain 30-fps playback.

All of the technologies we have discussed can be used to play back motion video; motion JPEG has the lead in market share. Two boards designed to provide full-motion JPEG (combined with DSP-based audio compression) are New Media Graphics' Super Motion Compression ($1,995) and VideoLogic's MediaStation ($2,995; Cambridge, Massachusetts). LSI Logic makes a JPEG chip set, which Rapid Technology Corp. uses on its Visionary compression board ($1,695; Amherst, New York). Further, at the time of this writing, C-Cube and Chips and Technologies have just announced an agreement to market digital video board kits that combine the CL550 processor with C&T's digital-video-manipulation chip set. But

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because it does not address the issue of audio data, and because by itself it still produces oversize files, JPEG-style frame-by-frame compression is only a partial solution to the video-compression problem, as we'll see below.

Even with symmetrical systems such as JPEG, you need faster hardware for compression than you do for decompression, because you have to compensate for the bottlenecks in the system—especially the overhead imposed by real-time digitizing, as required for video conferencing. As a result, the formulation of most video-compression technologies revolves around defining the resolution of the input image and the bandwidth you'll have for playback.

Videos meant to be played off a CD-ROM, with its limit of 150 kilobits per second on the transfer rate, for example, need far less drastic compression than video conferencing data to be sent over ISDN lines, which can handle only 64 Kbps per channel (with the added burden of processing it in real time). The lower the data-transfer rate, the more you need to compress the video and the poorer the quality.

In many cases the quality of a video-conferencing session need not be up to the standard of a clip on a computer-based training disk. But "acceptable quality" is a moving target. Some have suggested that we've gotten used to National Television Standards Committee (NTSC)–quality video and have learned not to notice its shortcomings—crosstalk, chroma crawl, fringing, and so forth—and that we need time to accustom ourselves to the artifacts introduced by video compression, such as smearing, jerkiness, and pixelation.

#### BETWEEN THE FRAMES

Merely compressing the individual frames and reducing the image size and the frame rate are impractical or insufficient methods for many video applications. While reducing image size or the number of frames per second serves to reduce the data bandwidth, both techniques also degrade the image. Compressing individual frames using the kinds of techniques discussed above does not in most cases shrink the data stream sufficiently to move full-motion video over the conventional PC bus. So in addition to those techniques, motion compression algorithms make use of *interframe redundancy*—the amount of image information that remains constant from one frame to another—to compact the data further.

In order to find this redundancy, the software usually divides the two frames into pixel blocks, searches for similar pixel blocks between the frames using a variety of techniques, and saves only the parts of the image that change between the two frames. Take, for example, a video clip of a bird gliding across a blue sky. The bird's change of position from one side of the screen to the other represents the only movement in the clip, so you can simply save the distance and direction in which the bird travels between the first frame and the second, the second and the third, and so on. This *motion compensation* usually occurs as a preprocessing step before any other compression techniques are applied.

> *DVI made multimedia software developers reconsider the PC as a viable platform for their applications.*

Of course, with rapid or substantial image changes from frame to frame, the picture will degrade rapidly. To counteract such degradation, motion compression algorithms let you specify *reference frames* (also referred to as *intraframes*)—compressed frames interspersed periodically throughout the clip.

The algorithms can use reference frames in two ways. The first technique, *forward prediction* (or just *prediction*), finds the differences between two frames then re-creates the second frame using only the first frame as a reference. In contrast, *interpolation* (also known as *average prediction* or *forward and backward prediction*) calculates the current frame based on differences between the last reference frame and the next reference frame, or even between the last reference frame and a predicted frame. As you might guess, the more reference frames you have—the less interframe compression you apply—the higher the video quality.

#### CHEAP AND EASY SOLUTIONS

In order to make digital-motion video available as part of the Multimedia Extensions to Microsoft Windows, Microsoft had to come up with a least-common-denominator compression method optimized for software-only decompression from a CD-ROM drive attached to a 386-based computer system.

The Audio-Video Interleave (AVI) format combines lossless run-length encoded intraframes with what the company calls Delta Frame compression, a simple predictive method that is not very computationally intensive. To meet a required data-transfer rate, AVI relies on the expedient of increasing or decreasing the number of frames per second it plays. This can lead to jerkiness, which tends to become visibly irritating at about 12 fps.

While software-only decompression is inexpensive, the quality suffers from the lack of computational support. Microsoft is even considering working hardware-assisted video into the next specification of AVI. Apple, which faces essentially the same dilemma as Microsoft, supports a variety of proprietary compression methods in its QuickTime multimedia API. The Video Compressor component of QuickTime generates what Apple calls "movies" at frame rates of anywhere from 10 to 30 frames per second. On playback, frames are added or dropped as necessary to preserve synchronization of all the audio and graphics elements across machines with differing CPU speeds. QuickTime movies use both interframe and intraframe compression, but unlike most of the other technologies discussed here, this package performs compression in the spatial rather than the frequency domain. Also, QuickTime uses JPEG for still images and RLE for computer-generated animation.

#### DVI: FIRST OUT OF THE STARTING GATE

Long before AVI, there was DVI. Intel was the first company to ship a motion-video compression solution for the PC platform, which seems to have been both a blessing and a curse. It was a blessing because its Digital Video Interactive (DVI) technology made developers of video editing and multimedia authoring software begin to consider the PC a viable platform for their applications. Unfortunately, the hype surrounding DVI raised people's expectations beyond what the initial offerings could fulfill.

Just as Microsoft needed to develop its own motion compression, the dearth of suitable, established compression tech-

nologies at the time forced Intel to develop two methods of its own: Real-Time Video (RTV) and Production-Level Video (PLV).

RTV is a symmetrical "on-line" compression scheme designed for desktop acquisition and editing of consumer VHS-quality video; the standard frame size is 128 by 240, which can be interpolated up to 256 by 480 during decompression. Initially, the software performs motion compensation by comparing adjacent frames. If the differences are very small, it subtracts one from the other; if the differences are large, it may decide to use the current frame as a reference. It then uses *vector quantization,* the process of finding frequently occurring "clouds" of pixels and encoding them, to compress the reference frames themselves. The audio information is compressed using Adaptive DPCM (ADPCM)—down to about 4-bit samples—and interleaved with the video data.

*In some applications, such as medical and scientific imaging, there is no such thing as "unnecessary" data.*

To use the higher-level PLV compression, however, you must send your video on 1-inch tape to Intel, where it uses higher-powered computers and devotes more time to optimizing quality and compression. RTV and PLV use essentially the same compression methods. But, for example, PLV offers the luxury of trying different-size pixel blocks in order to optimize motion compensation.

DVI faces some lingering problems. It is still a semiproprietary architecture. You need the ActionMedia II Delivery Board ($1,895) for playback, and if you want to do your own digitizing, you need the ActionMedia II Capture Module ($695) as well, currently available only from Avtex Research (Campbell, California), IBM, and Intel. Application support for playback of DVI-based video has also been limited to a few small market niches, most notably in the video editing and multimedia authoring categories. In the third quarter of 1992, however, Intel expects to ship its Audio Video Kernel (AVK) and Developer's Kit, a low-level API that interfaces with the DVI hardware. Intel is currently working on a higher-level API designed to be more application-developer-friendly, in order to spur software support. One use for the AVK is to allow Windows support for DVI as a component of the Windows Media Control Interface.

#### PICTUREPHONE PERFECT?

While DVI may have been the first real product to ship, the CCITT H.261 video conferencing standard has been under development for about the same length of time. Finally ratified a little over a year ago, the standard makes use of an algorithm called Px64 (pronounced P *times* 64). The *P* in Px64 refers to the number of possible frames per second, from 1 to 30, and the *64* refers to a single 64-Kbps ISDN channel over which the data will travel. H.261 covers two video formats: the 352-by-288 Common Intermediate Format (CIF) and the 176-by-144 Quarter CIF (QCIF).

To play a CIF file at 30 fps requires a transfer rate of 2.2 megabits per second (560 Kbps for QCIF). Squeezing even a QCIF-resolution image over the lines requires some pretty drastic compression, and Px64 achieves it by using only intraframe and predictive compression. Fortunately, however, very little motion takes place during a typical video conference, enabling fast motion-compensation search algorithms combined with high rates of interframe compression.

#### MUCH ADO ABOUT MPEG

To create an international standard to meet the needs of full-motion video at higher quality levels than the H.261 video conferencing specification can provide, the Motion Pictures Experts Group (MPEG) is currently working on the MPEG, MPEG II, and MPEG III compression specifications.

These specifications do not define the exact procedure for compressing video the way that JPEG does for still images. They merely specify the format and data rate of the output bitstream, as well as a set of compression techniques that can achieve varying degrees of quality. The complex set of compression tools MPEG uses includes JPEG for the intraframes, combinations of both predictive and interpolated motion compensation, and subband coding for audio.

MPEG is designed to run CIF- or SIF-resolution (352-by-240) video off a CD-ROM, with a target transfer rate of 1.2 to 3 Mbps at 30 fps. MPEG II and III set their sights higher: The former aims for the CCIR 601-standard 720-by-486 resolution running 5 to 10 Mbps (used by NTSC TV at 30 fps), while the latter will cover the HDTV standard (1,920-by-1,080 at 30 fps) with a data rate of 20 to 40 Mbps.

Since MPEG specifies only the output format, most of the products currently on the market perform MPEG decompression only. This includes Xing's *VT-Motion* ($149), a software-only decompression utility for original MPEG videos.

When it comes to hardware-aided decompression, however, there are two competing types of solutions. The first is C-Cube's MPEG technology processor, a programmable-core processor that can decompress only MPEG files. The Intel i750 and Integrated Information Technologies' Vision Processor, on the other hand, are more fully programmable; thus, boards built around these chips have a greater chance of being around to run future software that uses any as-yet-undeveloped compression technologies. Currently, they both support JPEG, MPEG, and Px64 decompression.

#### ONWARD AND UPWARD

Believe it or not, we've touched on just a few of the ways to squash pictures, as well as just a few of the reasons for doing so. Keep in mind that lossy compression isn't for everyone: In some applications, primarily medical and scientific imaging, there is no such thing as "unnecessary" data. And most publishers of high-quality books and magazines rightly shudder at the thought of playing with the pixels in their prized photos. Perhaps most important to the bulk of users, once an image or video has been lossy-compressed, it can't be edited and compressed again without a further degradation in quality.

That said, let's not lose sight of the benefits of lossy image compression. Today's methods represent the first strides down what will doubtless be a long road to reaping the full benefits of advancing digital graphics technologies. ■

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*Lori Grunin is an associate editor of* PC Magazine.

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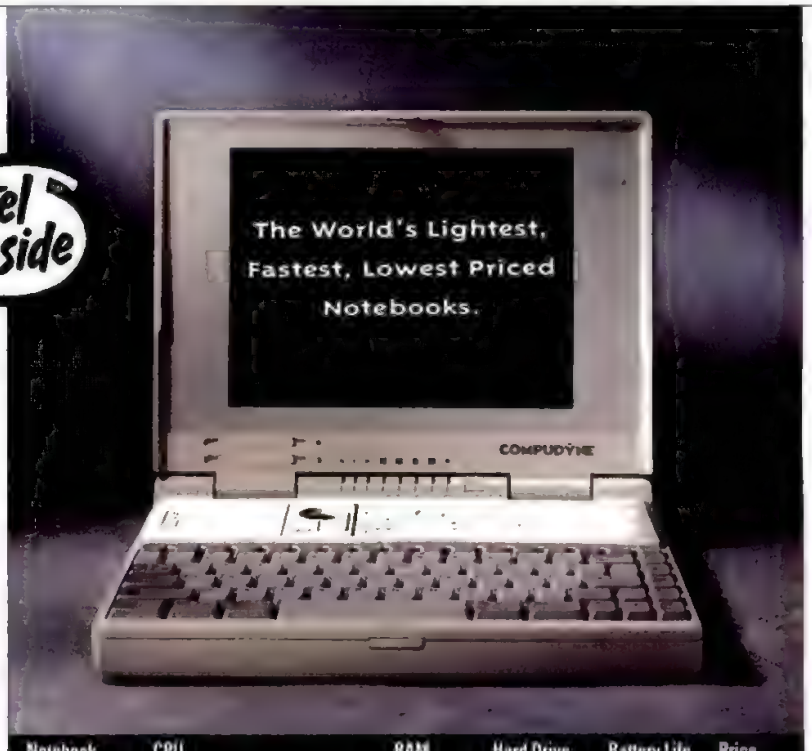


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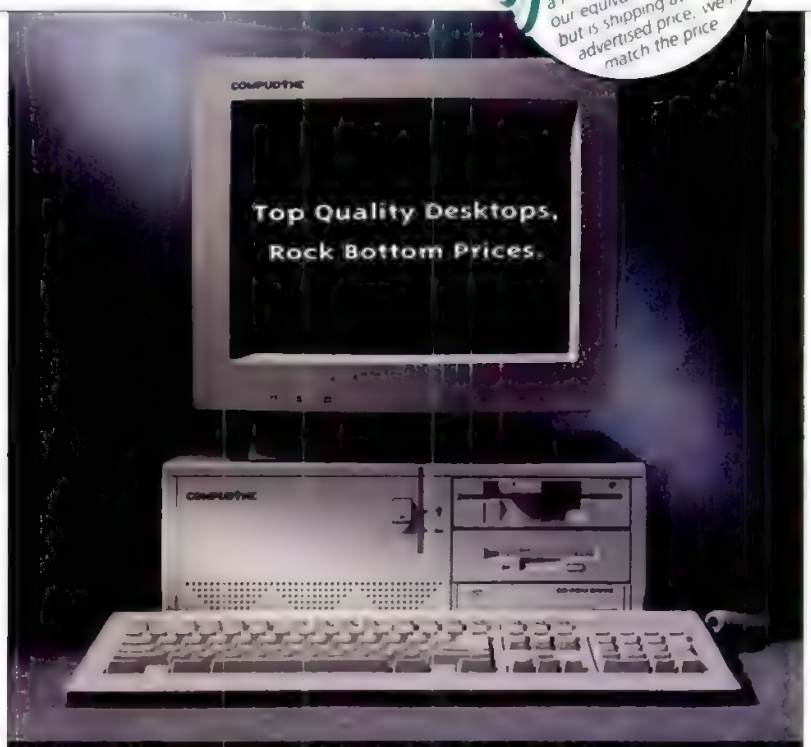


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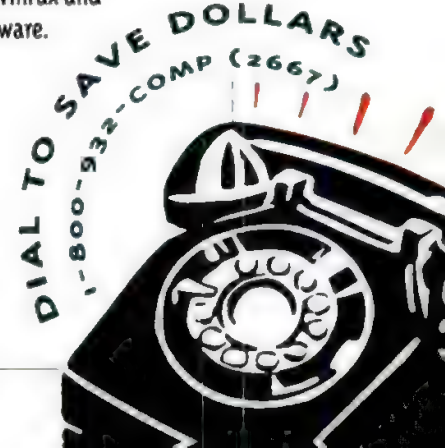

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CIRCLE 132 ON READER SERVICE CARD

by
Joe Salemi

# Advisor

- TURNING OFF NUMLOCK: Utilities to turn off the NumLock key when the system boots up.
- VRAM DRIVERS: Getting higher resolution with Video Seven cards.
- SMALL SPREADSHEETS: Scaled-down spreadsheet programs that fit on 720K floppy disks.
- LEGAL SOFTWARE: Automating simple legal forms.

## TURNING OFF NUMLOCK

Many of us old-timers who grew up on XTs dislike the automatic enabling of the NumLock key upon booting up more powerful machines. Is there a way to boot up with NumLock off?

David Elliott
Toronto, Ontario, Canada

*PC Magazine* has published several utilities that do this, most recently in the November 26, 1991, issue. The Tutor column in that issue includes a short DEBUG script called NUMLOCK.SCR; you can type it in with any ASCII editor and run it through DEBUG to create the file NUMLOCK .COM. The script and the file can also be downloaded from Library 7/Tutor of the PC MagNet Utilities/Tips Forum; the filenames are NUMLCK.SCR and NUMLCK.COM, respectively.

In Library 16/Gen Utils of the same forum, you'll find KEBOA.ARC, a collection of small utilities that toggle the NumLock, CapsLock, and ScrollLock keys. Finally, in Library 7/Tutor, you can find TOGGLE.COM, a utility that uses the command line to toggle the same three keys; it appeared in the May 31, 1988, issue. (Full details on joining PC MagNet can be found on page 10 of this issue.)

One other place you can check is the manual for your system; many of the new BIOSes have a built-in option to disable the NumLock key at boot time. You can set this option either through a setup screen that you activate when the system boots, or through a utility provided on-disk with the system.

## VRAM DRIVERS

I read with interest the cover story "786,000 Pixels Can't be Wrong!" in the June 25, 1991, issue. I run Windows 3.0 on a 386 equipped with a Video Seven VRAM VGA card with 512K RAM. The Video-Seven manual claims the board can achieve 1,024-by-768 resolution with 16 colors. However, Windows currently runs in VGA mode on my system. How can I reconfigure my Windows setup to get 16-color 1,024-by-768 resolution?

Donald L. Wollesen
Saratoga, California

In order to get higher resolution in Windows, you need video drivers from the card's vendor. Headland Technology Inc. (46221 Landing Pkwy., Fremont, CA 94538-5016; 800-238-0101, 510-623-7857) makes the VRAM, VRAM II, and 1024i cards as well as the 208e series used as the standard video card in many OEM systems (such as Northgate and Memorex). If you have a modem, you can download the latest Windows drivers from Headland's BBS at 510-656-0503. Otherwise, you can call the company at 800-248-1850 and request a disk with the latest drivers for a small shipping and handling fee.

## SMALL SPREADSHEETS

Spreadsheet programs are useful to those of us who compute while traveling, but the current offerings from Lotus, Microsoft, and Borland have grown to such a size that running them on a laptop with a single floppy disk drive is practically impossible. Features such as font control, presentation graphics, and hotlinks are not that important for portable computing. Can you recommend a streamlined spreadsheet that will run happily on a 720K floppy disk with room to spare for a few worksheets?

Mike Lampton
Berkeley, California

Shareware authors have stepped in here to fill the gap left by the bigger vendors. I found three shareware spreadsheet programs small enough to fit on a 720K floppy disk. The smallest is a program called *ALite* (Trius Inc., P.O. Box 249, North Andover, MA 01845; 800-468-7487, 508-794-9377; $20 plus $6 shipping). Taking only about 200K of disk space and requiring only 256K of RAM, *ALite* still gives you 2,048 rows by 128 columns, EGA support, and five types of graphs (see Figure 1). It directly supports *Lotus 1-2-3* .WKS and .WK1 files, and uses .WKS as its own format.

*ALite* is a scaled-down version of Trius's original spreadsheet, *As-Easy-As*, Version 5.0 ($69 plus $6 shipping), which provides 8,192 rows by 256 columns in about 320K of disk space. It is also .WKS- and .WK1-compatible, offers ten different graphs, has EMS and mouse support, and can record macros. You can download the latest shareware versions of *ALite* and *As-Easy-As* from Trius's BBS at 508-794-0762 or from Library 8/ASP Applications of the PC MagNet Utilities/Tips Forum as ALITE.ZIP and ASEASY .ZIP, respectively.

*InstaCalc* (FormalSoft, P.O. Box 1913, Sandy, UT 84091; 801-565-0971; $49 plus $5 shipping) uses its own file format but can import and export .WK1, *dBASE*, DIF, and ASCII files. It provides 4,096 rows by 256 columns; supports EMS, EGA graphics, a mouse, and file encryption; and uses only 390K of disk space.

**Figure 1:** *ALite* from Trius gives you *Lotus 1-2-3* compatibility in 2,048 rows by 128 columns while taking up only 200K of disk space.

*InstaCalc* has a unique feature: It can load as a TSR, taking up only 15K of RAM; it lets you cut and paste between the pop-up spreadsheet and the current application. You can order *InstaCalc* directly from FormalSoft or download it from Library 8 of the PC MagNet Utilities/Tips Forum as INSTA3.ZIP.

All three programs use the familiar slash (/) key to invoke their menus, and their function keys work much like *1-2-3*'s as well.

## LEGAL SOFTWARE

**I run a small business and occasionally need to create simple legal documents such as employment letters, consulting agreements, and bills of sale. I'd also like to be able to keep up a will and a power of attorney so my husband can keep the business running should anything happen to me. My lawyer handles major issues, but it can get very expensive to use her services for day-to-day legal matters.**

**Sophie Wattles**
**Washington, DC**

Obviously, no software program can completely replace the services of a lawyer, particularly for complex legal documents or actions. However, many common legal documents are composed mostly of boilerplate language, and the creation of these documents has been automated. Most documents produced by these programs can be used in 49 states; Louisiana is excluded, as its legal system historically derives more from the Napoleonic Code than from English Common Law.

Strictly for writing wills, there's *WillPower* by the nationwide legal firm Jacoby & Meyers (Jacoby & Meyers Law Offices, 1156 Avenue of the Americas, New York, NY 10036; 212-536-7600; $49.95). *WillPower* also helps you evaluate the assets and liabilities of your estate.

With Hyatt Legal Service's *Home Lawyer* (MECA Software Inc., P.O. Box 912, Fairfield, CT 06430; 800-288-6322, 203-256-5000; $79.95) you can create simple wills, powers of attorney, credit report requests, employment offers, consulting agreements, and residential real estate leases.

BLOC Publishing Corp. (800 SW 37th Ave., Executive Tower, #765, Coral Gables, FL 33134; 800-955-1888, 305-445-0903) offers two legal programs. *Professional Lawfirm* ($99.95), intended for small businesses, includes simple standard wills, living wills, powers of attorney, consulting agreements, bills of sale, promissory notes, and both residential and commercial leases. Documents created with this software can be exported to a number of word processors including *WordPerfect* and *Microsoft Word*. *Personal Lawyer* ($24.95) is a scaled-down version of *Professional Lawfirm* designed for individuals.

Finally, there's *It's Legal* (Parsons Technology, One Parsons Dr., P.O. Box 100, Hiawatha, IA 52233; 800-223-6925, 319-395-9626; $69), which includes simple and living wills, powers of attorney, a number of credit letters (see Figure 2), consumer complaint letters, employment offers, consulting agreements, and documents for equipment, residential, and commercial real estate leases.

While these programs were all designed with the benefit of extensive legal advice, I must stress again that they cannot completely replace the services of a lawyer. The programs and manuals let you know when the services you require are more than they can handle. Even in such cases, you might find that these programs help you ask the right questions, which can make using a lawyer's services more efficient and less costly.

**Figure 2:** A letter challenging your credit rating is one of the many legal documents you can create with Parsons Technology's *It's Legal*.

## ASK THE ADVISOR

Send your question to Advisor, One Park Avenue, New York, NY 10016, MCI mailbox PC MAGAZINE, or upload it to PC MagNet (see the instructions for joining on page 10 of this issue). ■

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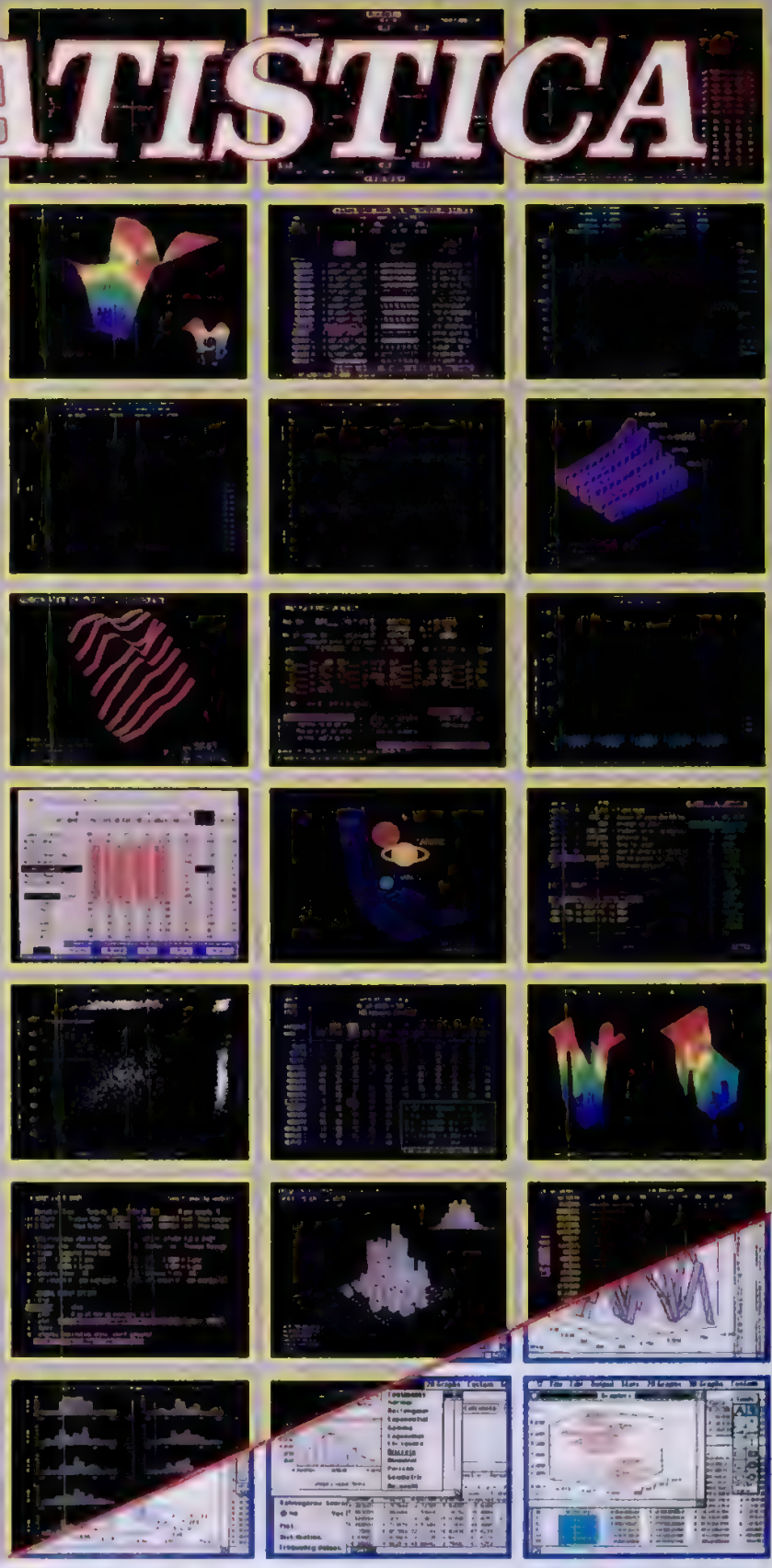

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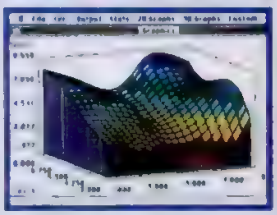

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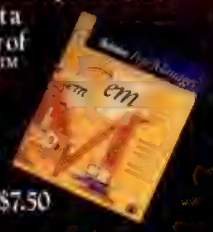

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CIRCLE 353 ON READER SERVICE CARD

by
Jeff Prosise

# Tutor

## COMPUTER TERMS, PART 2

In the last issue, we looked at some of the common terms and acronyms associated with systems and microprocessors. In this installment of Tutor, the second in a two-part series, we conclude with a glossary of terms related to disks.

■ COMPUTER TERMS, PART 2: The second in a two-part series defining common industry terms. This column covers disks.

### DISKS

The **boot sector** is a section of the disk that holds information that defines the physical characteristics of the disk; it also holds a short machine-language program that begins the process of loading the operating system into memory when you start up. A hard disk also contains a *master boot record,* which describes how the disk is *partitioned.* Each partition of a hard disk contains its own boot sector. See also *partition.*

The smallest unit of disk storage that DOS can allocate, a **cluster** consists of one or more contiguous *sectors,* the number determined by disk size. See also *sector.*

A **cylinder** is a collection of *tracks* (ring-shaped magnetic bands for data storage) located one above the other on the *platters* (individual disks) of a hard disk drive (see Figure 1). If you view the tracks from above, each set would form an imaginary cylinder.

A **disk cache** is a region of memory where data is stored on its way to or from a disk. Disk caching significantly enhances drive performance by replacing most physical disk accesses with data delivered straight from RAM. DOS 5.0 comes with a supplementary disk-caching driver called SMARTDRV.SYS, which substantially enhances hard disk performance. SMARTDRV.SYS simultaneously increases drive life (as does any cache) by decreasing wear and tear, since once the needed data has been read into the cache, subsequent accesses to the same information no longer come directly from the disk. Other caching programs such as Multisoft's popular *Super PC-Kwik* are available from third parties.

**ESDI (enhanced small device interface)** is a popular interface (connection) for large hard disks. ESDI gained acceptance in the 1980s as an alternative to the *ST-506* interface, which was limited by comparatively slow *seek* times (the period required for the disk *head* to find a track) and low *throughput* (the amount of data flowing in a given unit of time). ESDI controllers typically deliver *data-transfer rates* (throughput) of 10 *Mbps* (megabits per second) and higher, achieving rates above 20 Mbps in some implementations. See also *head, IDE, SCSI,* and *ST-506.*

The **FAT (file allocation table)** is a list, maintained by DOS, of all *clusters* on a disk. It includes their locations and tells whether they are available, bad, or in use by a file. The FAT also records the order in which clusters link to make a particular file. See also *cluster.*

A **high-level format** is a process of preparing a disk (or disk *partition*) to be used by DOS. Also known as a *logical format,* high-level formatting creates the *boot sector,* the *file allocation table (FAT),* and the *root directory* of a disk so that the disk may subsequently store files. In most instances, formatting also scans the surface of the disk for defective areas, marking off those it finds so they won't be used for data storage. DOS provides the FORMAT command for performing high-level formats. See also *boot sector, FAT,* and *partition.*

A **low-level fomat** is a process that creates *tracks* and *sectors* on a blank hard or floppy disk using timed electrical pulses sent through the write element of each *head* as it's moved across the spinning disk.

Most hard disks come already low-level formatted. Floppy disks, on the other hand, receive both low- and high-level formats when you use the DOS FORMAT command. Periodically low-level-

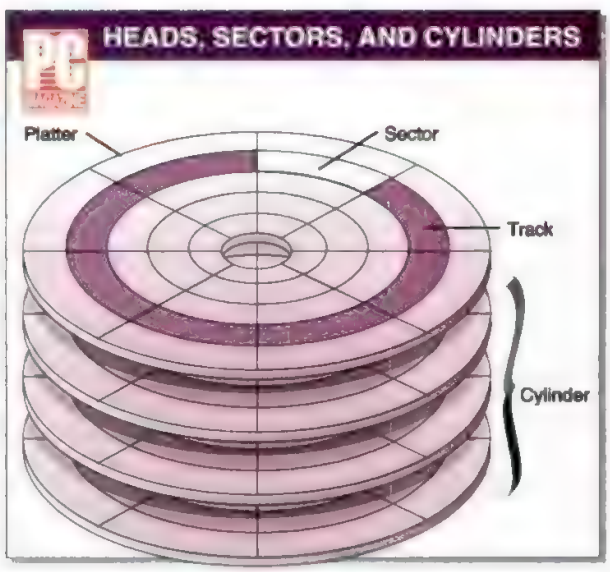


**Figure 1:** One way to characterize a hard disk is by the number of heads, sectors, and cylinders it has. A typical hard disk contains several drive *platters.* One head services each surface of every platter, so we can identify a disk side by the number of its head. The platters' magnetic surfaces are divided into concentric rings called *tracks,* which in turn are marked off into pieces called *sectors.* One vertical stack of tracks in the same position on every platter forms a *cylinder.* A 119MB hard disk with 512 bytes per sector might contain 7 heads, 1,024 cylinders, and 34 sectors per track.

formatting some types of hard disks combats an ailment known as *alignment creep*, where, over time, cylinders move as a result of mechanical wear in the drive head mechanism. Utilities such as Gibson Research's *SpinRite II* permit you to reformat a disk without destroying the data stored on it. A low-level format is also known as a *physical format*. See also *head* and *sector*.

A **head** is a device consisting of wire coils in a tiny case that moves across the surface of a disk. It can read information by sensing magnetic variations or write information using electrical pulses to create areas of changing magnetism on the disk face. Each side of every *platter* in a drive generally has a head. The heads are numbered, and sides of a platter are often specified using the head number. Double-sided floppy disk drives contain two heads, while most hard disks contain five or more.

In the late 1980s, a hard disk interface called **IDE (integrated drive electronics)** became popular for large hard disks (from 40MB to over 500MB) requiring medium or high throughput rates. The IDE interface gets its name because most of the control electronics are housed on the drives themselves rather than on the drive adapters (à la ST-506). Most of today's fast 386 and 486 PCs come with IDE drives. See also *ESDI*, *SCSI*, and *ST-506*.

**Interleaving** is a technique for ordering the *sectors* on a disk to optimize data-transfer rates. Sector interleaving eliminates the delay that results when a drive isn't ready to read or write the next sector immediately after it has read or written the previous one. On a disk where, for example, a second sector would pass the head before the drive could prepare itself for another access, a 3:1 interleave would solve the problem. Sector ordering on a drive with a 3:1 interleave is illustrated in Figure 2. Sequentially numbered sectors are located three sectors apart.

Most 386 and 486 PCs use a 1:1 interleave. An interleave that is either too high or too low for a given PC degrades drive performance by delaying reads or writes of consecutively numbered disk sectors. The wait can vary from the time required to spin through one sector up to the penalty imposed by a full rotation of the disk. See also *sector*.

**MFM (modified frequency modulation)** is the most widely used method for encoding binary data on the surface of a hard disk. It achieves a twofold increase in data density over standard FM (frequency modulation) recording. For details, refer to the October 30, 1990, Tutor column. See also *RLL*.

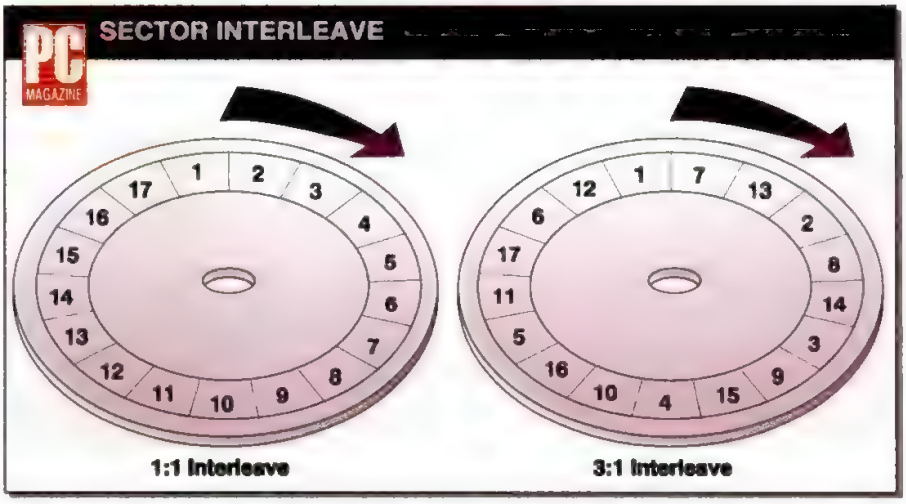


**Figure 2:** Sector interleave fine-tunes the performance characteristics of a hard disk by making sure that the next consecutively numbered sector spins around to the drive head at about the same time that the drive is ready for it. On a hard disk that employs a 3:1 interleave, sequentially numbered sectors are located three sectors apart. Pictured here are two hard disks—one with a 1:1 interleave, the other with a 3:1 interleave; each contains 17 sectors.

A **partition** is a portion of a hard disk that the operating system treats as if it were an entirely different drive. Once the disk has received its *low-level format*, you create partitions with the DOS FDISK utility. Any one operating system may use a partition. Before Version 3.3, DOS did not recognize partitions larger than 32MB. Depending on the partition size and the version of DOS being used, *clusters* will be either 2K or 4K. See also *cluster* and *low-level format*.

A **RAM disk** is a simulated disk created and maintained by a special driver that stores data electronically (in RAM) rather than magnetically. Properly used, RAM disks can boost the speed of disk-intensive application programs since they operate at memory speeds. DOS 5.0 comes with a RAM disk driver called RAMDRIVE.SYS; others are available from third parties. The data stored on a RAM disk goes away when power is removed, so files that you want preserved must be copied to a physical disk. RAM disks are also called *virtual disks*.

**RLL (run length limited)**, the second most widely used method for encoding data on the surface of a hard disk, takes the idea of intelligent encoding a step further than MFM by encoding groups of bits. The most common form, known as 2,7 RLL, packs up to 50 percent more than MFM recording. Other forms of RLL, often called ARLL (for *advanced RLL*) or ERLL (*enhanced RLL*), support even greater data densities. The simple act of replacing an ST-506 controller with an RLL controller and reformatting will turn a 20MB hard disk into a 30MB hard disk. However, RLL places greater demands on the hard disk, so don't swap controllers unless you've checked with the manufacturer to ensure that your hard disk is RLL-compatible. For a more detailed discussion of RLL, you can refer to the October 30, 1990, Tutor column. See also *MFM*.

**SCSI (small computer system interface)** is a hard disk interface frequently used on systems that require large hard disks (up to about 3 gigabytes) and high data throughput rates. (SCSI-2, the latest specification, provides for a transfer rate of 10MB per second with 8-bit data.) PCs communicate with SCSI devices by sending high-level commands, which are interpreted and acted on by SCSI control logic on-board the devices themselves. SCSI devices can be cabled together in a *daisy chain* (each one connected to the next), so that several mass-storage devices (hard disks, tape drives, and so on) can be attached to a single adapter. See also *ESDI*, *IDE*, and *ST-506*.

A **sector** is the smallest unit of storage on the surface of a disk—generally con-

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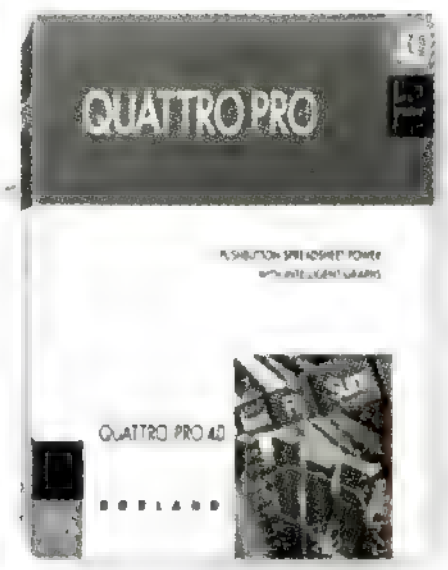


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taining 512 bytes of information. Sectors on a disk are all one fixed size. Each track of a disk is divided into several sectors, as shown in Figure 1. A typical hard disk contains from 17 to 34 sectors per track. This figure can be higher for disks that use *zone-bit recording,* in which the sector count varies according to the distance from the center of the disk.

**ST-506** is the hard disk interface found in IBM's PC-XT and still used today in many hard disks with capacities under 40MB. The ST-506 interface was developed in the late 1970s by Seagate (then

> Buffered seeks can increase drive performance by rearranging random track requests, carrying them out in consecutive order.

Shugart Technology) and characterized by a 34-pin control cable, a 20-pin data cable, and a modest 5-megabit-per-second data-transfer rate. A variation of ST-506, called *ST-412,* uses a technique called *buffered seeks* to reduce seek times and increase drive performance by rearranging random track requests, carrying them out in consecutive order. Because the two interfaces are closely related, the term *ST-506/412* is often used to describe both. See also *ESDI, IDE,* and *SCSI.*

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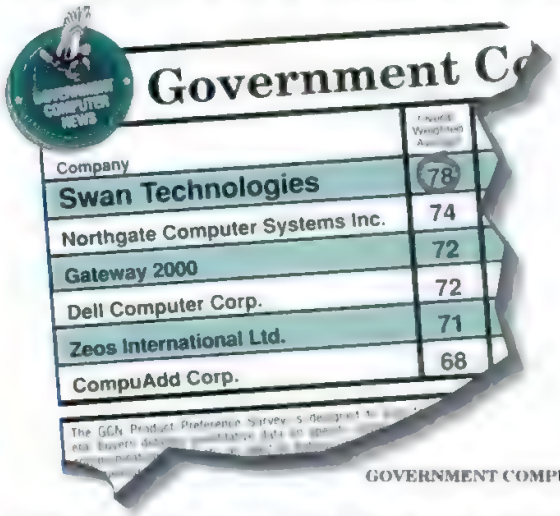


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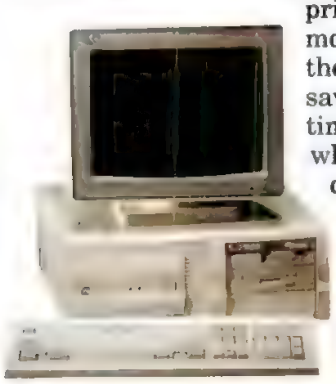

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by
Neil J. Rubenking

# User-to-User

## ENHANCING THE CD COMMAND

I've gotten used to using multiple dots after a CD command while working on a Novell network. For example, I can type CD.. to back up one directory level, CD... to back up two levels, CD.... for three, and so on. This is a quick and easy way out when I find myself several levels deep in directories.

Unfortunately, you can't do this on a local hard drive. I've tried batch files or setting an environment variable, all without satisfactory results. (DOS doesn't like naming files CD....BAT.)

But with DOS 5.0's DOSKEY, I can build my own enhanced CD command, by creating a macro like this:

```
DOSKEY CD...=cd.. $t cd..
```

This lets me type `CD...` at the DOS prompt to move back two directory levels. If I create another macro, for `CD....`, I can jump back three levels. I don't even need to type the CD part of the command in capital letters. DOS reads `cd...` the same as `CD....`

To make these macros available every time I boot up, I created a batch file called CDMACROS.BAT (Figure 1). My AUTOEXEC.BAT file first loads DOSKEY into high memory with the LOADHIGH command and then calls CDMACROS.

As an added benefit, these macros replace the network version of the commands, and they actually work better. The network version is sometimes a pain because if you're two levels deep and want to go to the root directory, you'd type `CD....` But if you accidentally type `CD....`, you get an "invalid directory" error message and you're left just where you started. You then have to retype the command or call back the old one and edit it. But the DOSKEY macro backs you up to the root *first* and then presents you with the error message. No more retyping; just ignore the message and continue on your way. I hope this is a useful trick for people like me who work on a network and on a local hard drive.

Mark D. Whitney
Orlando, Florida

- **ENHANCING THE CD COMMAND: DOSKEY brings a network-like version of the CD command to your local drive.**
- **FINDING THE LENGTH OF A STRING: Use this technique to get the length of any string that fits on the DOS command line.**

This tip opens up a wide range of possibilities for DOSKEY macros; macro names do *not* have the same limitations that apply to filenames! My experimentation turned up 33 characters that DOS bans from filenames but accepts in macro names. These include a dozen punctuation marks:

```
" * + , . / : ; ? [ \ ]
```

and 21 of the 32 control characters

```
^A, ^B, ^D, ^E, ^G, ^K, ^L,
^N, ^O, ^Q, ^R, ^U, ^V, ^W,
^X, ^Y, ^Z, ^\, ^], ^^, ^_
```

Try it! Do something innocuous at first, like `DOSKEY ^D=DIR`. Now type Ctrl-D and Enter; you get the directory listing just as if you had typed DIR normally.

I really can't guess what directions DOS 5.0 users will take with these new macro possibilities. Some may use single Ctrl-key names for macros, such as ^Q for QBASIC, ^K for CHKDSK, or ^E for DIR /O:E. Others may devise arcane macro names like :::■::: or ??????????. But they'll have to work hard to approach the usefulness of these simple extensions to the CD.. command!

## FINDING THE LENGTH OF A STRING

The fascinating shift technique used in GETLEN.BAT (User-to-User, September 24, 1991) is worth remembering. But it turns out that there's a fairly straightforward way to find the length of a string with a DOS batch file. LENGTH.BAT (Figure 2) first dumps the string into a text file. Then, with a standard trick featured in previous User-to-User columns, it turns a line of the directory listing into a batch file call, putting the length of the file into an environment variable.

The text file has an extra `^M^J` at the end, so the string would normally be two characters too long; to fix this, I used a tiny EDLIN script to insert a `^Z` in the file at the end of the string. The `^Z` acts as an end-of-file marker and thus lets us trim the file to the correct length with the TYPE command.

Here's how it works. The first line provides a usage note if no argument is passed. (You could also check here to see if the environment string `N` is already in use.) The second line will actually be used later, when LENGTH.BAT is called again (this time with a nonnull %2), to set

CDMACROS.BAT — COMPLETE LISTING

```
@ECHO OFF
c:\dos\doskey CD...=cd.. $t cd..
c:\dos\doskey CD....=cd.. $t cd.. $t cd..
c:\dos\doskey CD.....=cd.. $t cd.. $t cd.. $t cd..
```

**Figure 1:** This batch file uses DOSKEY to add network-like extensions to the CD command.

the variable N to the length we want. The next line puts %1, the string we want to measure, into a temporary file, with the block character ■ (ASCII 254) as an end-of-string marker. You can use any character that isn't likely to be in the string. Of course, this is where we really want to put a ^Z, but DOS won't let you put one in a batch file. (Try it for yourself and see what happens.)

Next, we change the block character to a ^Z with an EDLIN script I called LENGTH.SCR:

```
1R■^Z^VZ
E
```

You can create this file with EDLIN itself, using the /B switch on the command line. In the listing, ^Z and ^V represent single control characters. The EDLIN R command replaces what's before the ^Z with what's after it, so in this case the block is replaced with a ^Z character, represented by ^V (which is the EDLIN escape symbol for control characters) followed by a capital Z.

Once the ^Z is in place, we can trim the file with the TYPE command, which interprets the ^Z as an end-of-file marker. Now the file LENGTH.TXT contains only the string characters.

Next the batch file uses the command `FIND /V "i"` to extract the LENGTH.TXT entry from the directory listing, along with its size, date, and time. (It just happens that all the lines we don't want contain *i*, while the line we do want doesn't normally contain any lowercase letter other than *a* or *p*.) The selected line

LENGTH.BAT — COMPLETE LISTING

```
@ECHO OFF
IF '%1'==''' GOTO help
IF NOT '%2'==''' GOTO setn
ECHO %1■> L.TMP
EDLIN L.TMP < LENGTH.SCR > NUL
TYPE L.TMP > LENGTH.TXT
DIR LENGTH.TXT | FIND /V "i" > L.BAT
CALL L
DEL LENGTH.TXT
DEL L.*
GOTO end
:setn
SET N=%2
GOTO end
:help
ECHO Usage: length string
:end
```

**Figure 2:** This batch file is able to find the length of a string simply by creating a file that contains nothing but that string, then checking the size of the file.

is put into L.BAT which, when called, simply calls LENGTH.BAT again, this time with the length of the string in %2. Finally, a few cleanup lines, and then we're finished. Notice that, unlike GETLEN.BAT, LENGTH.BAT gives you the exact length of the string even if it is greater than eight characters.

Fred Commoner
Brighton, Massachusetts

It seems that EDLIN will never die: It's the one editor that everyone has, and it can be controlled with a command script. Certainly it proves useful as an aid to this batch file.

The author refers to "an extra ^M^J" at the end of the line in LENGTH.TXT. This is programmer-ese for a carriage return character and a line-feed character. Ctrl-M, ASCII 13, corresponds to a carriage return, and Ctrl-J, ASCII 10, to a line-feed. Every line in a plain DOS text file ends with this pair of characters, though you don't see them. By shoehorning a Ctrl-Z (end-of-file) character into the line *before* these characters, LENGTH.BAT makes it possible to truncate the file so it holds nothing but the desired string. At that point, the size of the file is the length of the string.

> It seems that EDLIN will never die: It's the one editor everyone has, and it can be controlled with a command script.

I cleaned up LENGTH.BAT just a little; LENGTH1.BAT shown in Figure 3 is the result. This version avoids using the temporary file L.TMP; it works directly on the file LENGTH1.TXT. Instead of using TYPE to trim the file, it uses the COPY command to truncate LENGTH1.TXT at the first ^Z. When you use COPY to concatenate files, it strips the ^Z from each file, adding a ^Z at the end of the resulting file. Appending the /B switch to such a command causes COPY to omit the final ^Z.

LENGTH1.BAT — COMPLETE LISTING

```
@ECHO OFF
REM LENGTH1.BAT
IF '%1'==''' GOTO help
IF NOT '%2'==''' GOTO setn
ECHO %1■> LENGTH1.TXT
EDLIN LENGTH1.TXT < LENGTH.SCR > NUL
COPY LENGTH1.TXT+,, /B > NUL
DIR LENGTH1.TXT | FIND /V "e" > L.BAT
CALL L
DEL LENGTH1.TXT
DEL L.BAT
GOTO end
:setn
SET N=%2
GOTO end
:help
ECHO Usage: length1 string
:end
```

**Figure 3:** This modified version of LENGTH.BAT uses fewer temporary files.

The line

```
COPY LENGTH1.TXT+,, /B
```

says "concatenate LENGTH1.TXT with *nothing*, omit the Ctrl-Z at the end, and store the result in LENGTH1.TXT." Amazing!

Since L.TMP isn't used, this version specifically deletes L.BAT, not L.*, thereby reducing the risk of accidentally deleting files not created by the batch file. And the FIND line selects all lines that don't contain *e* rather than those that don't contain *i*. The original failed to strip out the "bytes free" line; this version catches it.

This is a nice all-DOS solution, but there are easier ways. If you've downloaded *PC Magazine*'s STRINGS utility, you can eliminate LENGTH.SCR and use the single line

```
STRINGS n=length %1
```

to replace the contents of LENGTH.BAT.

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by
Fran Finnegan

# Windows

## QUICK-REFERENCE CARDS

I'd like to pass on a simple tip for producing a tailorable quick-reference card for function keys and similar lists in the Windows environment. For example, *Microsoft Excel*'s Help contains a list of function keys in the Keyboard section. Choose Edit Copy to get the section to the Clipboard, paste it back into an *Excel* spreadsheet, format it to taste, and print it.

David Jobling
Tokyo, Japan

PC MAGAZINE The ability of the Windows Help application to copy help pages to the Clipboard makes this tip possible. Help copies the text of the help page onto the Clipboard, from which you can paste it into any number of applications. Because the *Excel* Function Keys help page is laid out in a columnar fashion, the text gets placed onto the Clipboard as tab-delimited fields. The text can therefore be pasted into *Excel* cells very neatly. Formatting is a snap, as you can see in Figure 1. This technique should also produce satisfactory results with other Windows applications' help pages.

For full-screen DOS programs, the Print Screen key can be used to copy the screen contents to the Clipboard. Once you are back in Windows, you can paste the textual contents into *Excel*, the Notepad, or any number of applications.

- QUICK-REFERENCE CARDS: Use the Windows help system to produce command lists.
- THE DOS ENVIRONMENT: Help prevent UAEs by increasing your DOS environment's size.

## THE DOS ENVIRONMENT

Bill Machrone's article "Windows Bugs" in the October 29, 1991, issue was a breath of fresh air. I, too, thought I was the only one with Unrecoverable Application Errors (UAEs).

I would like clarification on a term used in his article. There is a reference to increasing the *DOS environment*. I have searched the Windows manual and its glossary, and reviewed the sections on PIFs, and found no reference to the DOS environment. Can you be more specific on what he means by this and how it relates to UAEs?

Jeffrey W. Emerson
Mokena, Illinois

PC MAGAZINE The *DOS environment* is an area of memory that DOS sets aside to hold variables that specify your computing environment. For example, the DOS PATH and PROMPT commands store their information in the environment. But even though the environment is part of DOS, you may still get UAEs if it is not large enough for Windows' needs.

Whenever you run any application under Windows, be it a Windows application, a DOS application, or COMMAND .COM itself, Windows passes the application a copy of the DOS environment. This copy starts with whatever variables were present in the environment when you first loaded Windows; then Windows adds some specialized information. You can see one of the things it adds (a variable named `windir`) by entering the SET command in a DOS shell under Windows; the rest of what is added (some information that is passed to the application's start-up code) is hidden, so you can't see it with the SET command. If there's not enough free space in the environment for the information that Windows needs to pass to the application, then you may get UAEs, depending on whether or not the start-up code of a particular application is sensitive to the information that Windows cannot fit into the remaining free environment space. To get around this problem, keep your environment large enough that at least 128 bytes of it are always empty.

To determine how much of the environment you have used so far, you can enter this command at any DOS prompt:

```
set > env.txt
```

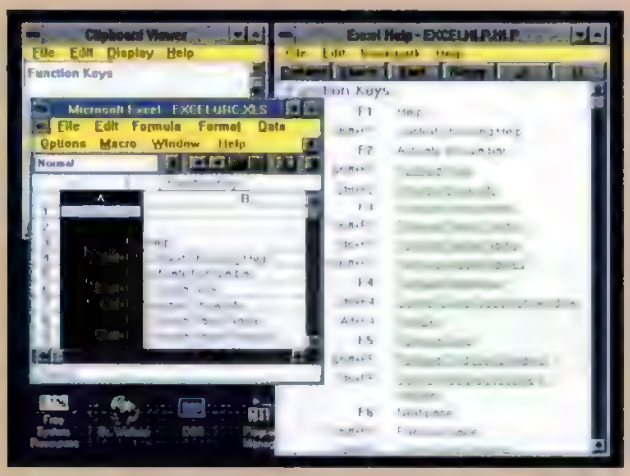


**Figure 1:** Help text can be copied to Windows' internal Clipboard and then pasted into *Excel* or other applications for formatting.

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This creates a file named ENV.TXT that will contain the contents of your environment. If you then enter

```
dir env.txt
```

you can see approximately how much of your environment is used up by noting the file size of ENV.TXT. You can then delete ENV.TXT.

The default size for the environment is 128 bytes in DOS 3.2 and earlier, 160 bytes in DOS Versions 3.3 to 4.01, and 256 bytes in DOS 5.0. However, you can change the environment size using the /E: switch on the SHELL= line in your CONFIG.SYS file. If you don't have a SHELL= line, create one, like this:

```
SHELL=C:\DOS\COMMAND.COM C:\DOS
  /E:1024 /P
```

If your COMMAND.COM is not in the directory C:\DOS, change the two occurrences of that directory to the one you actually use. The line above sets a 1,024-byte environment. If you're using DOS 3.1, you must use the number of 16-byte paragraphs, not the number of bytes. DOS versions prior to 3.1 don't support the /E: switch, but Windows 3.*x* won't run under those DOS versions anyway.

As Machrone mentioned, increasing the environment size seems to be a kind of witchcraft. We hope this explanation will shed some light on the topic, so you'll understand that there are reasons for the things that go wrong in Windows. When you know what is happening under the surface, you'll see that it's really not witchcraft, but, as Machrone said, sometimes you have to be a wizard to figure it all out.

To learn more about some of the causes of UAEs, see the Windows column in the January 14, 1992, issue.

## OPENING WINDOWS

Share your Windows experiences with Fran Finnegan; we'll pay you $50 for any tip we print. Mail your contribution on-disk, with a printout, to Windows, *PC Magazine*, One Park Avenue, New York, NY 10016, or e-mail it (re: PC Magazine) to PC MagNet: 76244,145; MCI Mail: Fran Finnegan; BIX: franfinnegan; GEnie: finnegan Internet: finnegan@well.sf.ca.us. We regret that we are unable to acknowledge submissions or answer questions individually. ■

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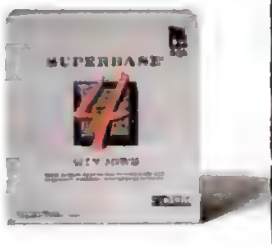


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by
M. David Stone

# The Working Word

## CHANGING FONT SIZE

There's an apparent limitation in *Ami Pro* 2.0 concerning fonts. Even though the program comes with *Adobe Type Manager*, the font sizes available after clicking on the status bar's Font Size button allow a maximum of 60 points. This is too small for full-page *Print Shop*–style signs and is just barely adequate for newsletter headlines. There are also some gaps between the size choices in the allowable range, making it difficult to fit large text to the page.

One way around this shortcoming is to use the Lotus-supplied macros, FontUp and FontDn with the SmartIcons designed for them (the letter A with the up or down indicators). You can then select the text and click the font size up or down 2 points at a time. But this will take a lot of clicking for large changes in size.

A better solution is to build a macro that takes advantage of the FontChange function to set the font size. (Alternatively, you can use FontPointSizeChange as the macro in Figure 1 demonstrates.) You can use a dialog box or the query command to ask for the new point size to use, and then enter any point size you like, not just *Ami Pro*'s predefined choices.

When your font size gets larger than 500 points or so (depending on the page size and margins), you can't fit even one letter on an 8.5- by 11-inch page. *Ami Pro* will change the font size, but it will also display an error message warning you that the text won't fit, and you won't be able to see the text. Much the same thing can happen to text that's in a frame, when you make the point size larger than what can fit in the frame. With text in a frame, however, the text simply disappears. In either case, don't panic. The text is still selected and exists in some invisible domain known only to *Ami Pro*. To bring it back, choose a smaller font size. Be sure not to touch any keys that will deselect the text until it is visible again.

Mike Graham
Hapatcong, New Jersey

- **CHANGING FONT SIZE:** How to set an arbitrary font size in *Ami Pro*, *Word for Windows*, and *WordPerfect for Windows*.
- **REMOVING EXTRA SPACES REVISITED:** Deleting unwanted extra spaces in any word processor.

Using a macro to set font size can be quite convenient, but before looking at the macro in Figure 1, you should know that you don't need to create a macro to set text to any font size you like in *Ami Pro* 1.2 or 2.0. You can simply choose Text Font, and then enter any arbitrary point size in the Points text box. Unlike the selections available through the status bar, you are not limited to choosing from a predefined list. The macro's advantage is that it will take you to a text box with a single keystroke or mouse click, so you can change font size with minimum effort.

If you make the text size too large to fit on your screen and accidentally deselect it before changing it back to a smaller size, you *can* still retrieve it easily, by switching to draft mode. First, choose View | View Preferences, and make sure there's a check in the "System font in draft mode" check box. Then make sure the cursor is in the appropriate text stream. (A *text stream* in *Ami Pro* is any chunk of connected text. All body text is a single text stream; so is all the text in a given frame.)

Next, choose View | Draft Mode, and the oversize text should appear in your system font. All you have to do then is select the text and change it to a suitable font size. If you want to see the text in its WYSIWYG format again, just choose View | Layout Mode.

Note that *selecting* a frame isn't the same as putting the cursor in the frame's text stream. Click on a frame once to select it, and you'll see the eight handles that let you adjust frame size, but you won't see a cursor in the frame. If you double-click on it, you'll see the handles grayed out and a blinking cursor inside the frame; this is where you want to be. If you can't choose draft mode (the option is grayed out), that means the cursor isn't in a text stream.

When you choose View | Draft Mode, you may see a solid block rather than text. This happened to me in one test run. Don't let that throw you. Select the block just as if it were the text you expected to see, adjust the font size, and choose View | Layout Mode. When you switch back to layout mode, the block should switch back to text.

The *Ami Pro* 2.0 macro in Figure 1 is as simple a macro as you can write in *Ami Pro*. It asks a question, waits for the user to type a response at the keyboard, and then uses the response to change a setting in the program. To create the macro, open a new *Ami Pro* document, type it in, and save it with an .SMM filename extension in whatever directory you've specified as the default macro directory (choose Tools | User Setup then Paths to see the current setting or to change it). Then assign it to a shortcut key or SmartIcon.

The Function and End Function lines are required in all *Ami Pro* macros. The first line

```
Function FontSize()
```

identifies the function you're defining in the macro, in this case FontSize. The next four lines do the actual work, getting information about the current font, putting a dialog box on-screen that asks what font size to use, and then changing the current font size—including the size for any selected text—based on your entry.

FONTSIZE.SMM COMPLETE LISTING

```
FUNCTION FontSize()
defstr name, color, size, family                    'Declare variables

GetCurFontInfo(&name, &color, &size, &family)
Size =Query$("Enter New Font Size to Use:", size/20)
FontPointSizeChange(Size)
END FUNCTION
This Ami Pro 2.0 macro provides an easy way to change text to any
arbitrary font size.  Either select the text to change, run the
macro, and enter the new point size, or run the macro, enter a
point size, and type new text in that point size.
```

**Figure 1:** This *Ami Pro* 2.0 macro provides an easy way to change text to any arbitrary font size. Either select the text to change, run the macro, and enter the new point size, or run the macro, enter a point size, and type new text in that point size.

(According to the *Ami Pro* documentation, you need a comma in the Query function between the text in quotes, which is the text you'll find in the dialog box, and the variable after that text. The truth of the matter is that the function works just as well without it, but Lotus recommends keeping it in, both for readability and to ensure that the macro will continue to work, should future versions of the language require it.)

The font size returned by the GetCurFontInfo function is not in points, but in twips. A *twip* is a twentieth of a point. The macro, therefore, defines the default setting for the Query function as `size/20`, to convert the twips to points. The FontPointSizeChange function, in contrast, uses points, so there is no need to convert the number back to twips. However, if you use the FontChange function instead of the FontPointSizeChange function to set the new font size, you would have to convert the number back, and the line would read

```
FontChange(name, 0, color,
(size*20))
```

Finally, if you use *WordPerfect for Windows* or *Word for Windows*, your program has a built-in equivalent to this macro: In *WordPerfect for Windows*, it's F9 or you can click on the Font button, and in *WinWord*, it's Ctrl-P or click on the Ribbon's point-size button. As with *Ami Pro*, *WordPerfect for Windows* will let you enter any font size that you need, whether it is on the supplied list of sizes or not. *WinWord*, however, (and *Word* for DOS, for that matter) will accept font sizes only up to 127 points. (All this assumes the font size you want is available on your system. See the December 31, 1991, Working Word column for an in-depth discussion of this.)

With *WinWord*, Version 1.1 (and *Word* for DOS), you're pretty well stuck with the maximum 127-point size—unless you produce the text in a graphics program and import it as a graphic. With *WinWord* 2.0, you can use the WordArt mini application to produce larger text. However, note that text produced as a WordArt graphic will be treated as a single graphic. Its lines will not spill over to the next page or fall back to the page before as individual lines. Rather, the entire graphic will be treated as one object. For obvious reasons, editing such text can be a chore.

## REMOVING EXTRA SPACES REVISITED

In the October 29, 1991, issue of *PC Magazine*, the Working Word column describes macros for deleting unwanted double spaces in *WordPerfect*, *Word* for DOS, and *Word for Windows*. But there is a much less complex method that will work in nearly any word processor. Simply use the search-and-replace feature in the program to search for two spaces and replace them with one. To be sure you delete all unwanted spaces—including groups that start out as more than two spaces together—repeat the search-and-replace as necessary until there are no more matches.

Tom Hoefer
Yellowknife, Northwest Territories
Canada

The macros in the October 29 column take advantage of each program's search feature to find the double spaces. The macro logic then decides whether to move on or ask whether to delete a space. The advantage of using a macro rather than the search-and-replace feature is that a macro can also check to see if the spaces are preceded by a period, colon, question mark, or exclamation point. If the macro finds any of these, it will simply search for the next instance of double spaces, rather than stopping and waiting for you to make a decision, the way the search-and-replace function must.

On the other hand, many people who use proportionally spaced fonts always use only a single space after these punctuation marks. Others make a point of avoiding question marks and exclamation points in text, and follow colons with one space rather than two. If you fall into one of these categories, there's absolutely no advantage to using the macros rather than a search-and-replace feature. If you want to have double spaces after periods, simply do a final search-and-replace that looks for a period followed by a single space and replaces it with a period followed by two spaces.

*Word* for DOS users should also note that there was a typographical error in the *Word* 5.0 macro, REMSPACES.DOC, that appeared in that October 29 column. The line that begins

```
« If Mid(Selection,1,1)="?" »
```

should have a caret before the question mark so that it reads

```
« If Mid(Selection,1,1)="^?" »
```

The caret tells *Word* to look for a literal question mark. Without it, the question mark is a wildcard that will match any text character. The version of the macro originally on PC MagNet has the same error, but the current version of RMVSPC.DOC is correct.

## TIPS FROM WORKING WORDSMITHS

Tell the Working Word your latest word processing discovery; we'll pay you $50 for any tip that we print. Please send your contribution on-disk along with a printout to The Working Word, *PC Magazine*, One Park Avenue, New York, NY 10016, or you can upload it to PC MagNet (see page 10 for access instructions). We regret that we are unable to acknowledge submissions or answer questions individually. ■

by
Craig Stinson

# Spreadsheets

## QUICK ACCESS TO FUNCTIONS

Here's a keyboard shortcut for entering functions or advanced macro commands in *Lotus 1-2-3 for Windows*. Start by typing @ (for a function) or { (for a macro command). Then press the Name key, F3. *Lotus 1-2-3/W* will display a list box of all the available functions or macro commands. Then press Tab once, followed by the first letter of the function or macro command you want to use. The program will respond by taking you to the next item in the list that begins with the letter you pressed. From there, you can easily find the function or command you want and press Return to enter that name on the command line.

Don Roche, Jr.
Austin, Texas

PC MAGAZINE Nearly all list boxes in all Windows dialog boxes function in the manner Mr. Roche describes. Pressing any letter takes you to the next item in the list that starts with that letter. So, for example, in the *1-2-3/W* Functions list box, pressing C once would select CELL; pressing C a second time would highlight CELLPOINTER. Subsequent presses would take you to CHAR, CHOOSE, CLEAN, and so on.

When you press the F3 key after typing an at sign (@) or left brace ({), *1-2-3/W* displays a dialog box consisting of an edit line and a list box. To get to the list, so that you can use the first-letter search method to find the item you want, you have to press Tab or click on the list with the mouse.

*1-2-3/W* also includes an optional SmartIcon that will enter the @ for you and take you straight to the functions dialog box. You can add this icon to your SmartIcon palette by choosing the Tools SmartIcons command and clicking the Customize button. Then select the @ icon (in the Standard icons gallery) and click the Add button. If you're using *1-2-3/W* on a standard VGA display (480 by 640 pixels), you'll probably want to delete one SmartIcon from the default palette to make room for the newcomer. You can do that by choosing the Tools SmartIcons command, clicking the Customize button, selecting the icon you want to unload, and then clicking the Remove button.

- QUICK ACCESS TO FUNCTIONS: Two ways to speed up entering functions and macro commands in *1-2-3/W*.
- CHANGING COLORS IN 1-2-3 2.3: How to change the default colors in *Lotus 1-2-3*, Release 2.3.
- A 1-2-3–LIKE EXCEL HISTOGRAM FEATURE: This macro adds a histogram menu choice to *Microsoft Excel* that lets you specify a range of intervals.

## CHANGING COLORS IN 1-2-3 2.3

I'd like to correct an error in your review of *Lotus 1-2-3*, Release 2.3 ("Spreadsheets Begin to Put the User First," December 31, 1991). You say that Release 2.3's default white-on-black color scheme in text mode can't be altered, but in fact it can. Attach Wysiwyg and alter the color scheme to your liking with the :Display Color commands. When you detach Wysiwyg and return to text mode, your color scheme will still be in effect. Then you can use the /Worksheet Global Default Update command to make your customized color scheme the default.

The only drawback to this technique is that if you start *1-2-3* in graphics mode (with Wysiwyg attached) without first using the :Display Default Update command to save your color scheme in Wysiwyg, the colors revert to Wysiwyg's original defaults, giving you white on black again.

David R. Crawford
Fenton, Michigan

PC MAGAZINE Mr. Crawford is right. Whenever you switch from graphics mode to character mode in *1-2-3*, Release 2.3, whether you do it by detaching Wysiwyg or by using Wysiwyg's :Display Mode Text command, you get the same color scheme you were using in graphics mode. If you use *1-2-3*'s /Worksheet Global Default Update command, the current text-mode colors are recorded in *1-2-3*'s configuration file, 123.CNF. If you then start a new *1-2-3* session without Wysiwyg attached, *1-2-3* still uses your modified color scheme.

If you want to use the same nondefault color scheme in both graphics and text modes, use :Display Default Update to record that scheme in Wysiwyg's configuration file, WYSIWYG.CNF. Then hop over to character mode and repeat the save with /Worksheet Global Default Update.

Note that all this applies only to Release 2.3. In Release 3.1, when you switch from graphics mode to character mode, you get the standard setup of black, white, and cyan, no matter what you've designed in Wysiwyg.

## A 1-2-3–LIKE EXCEL HISTOGRAM FEATURE

I have just read your December 31, 1991, issue, and found the histogram macro for *Microsoft Excel* to be very interesting. Having used *Lotus 1-2-3* to create histograms, I thought that perhaps duplicating the way the Lotus /Data Distribution command works may help those who are more familiar with that interface. Also, I think the ability to choose a distribution range is valuable when you want unevenly spaced intervals, or when they are not placed in the column next to your data.

I used your ideas and wrote the macro

HISTOGRM.XLM — COMPLETE LISTING

| | A | B |
|---|---|---|
| 1 | =ADD.COMMAND(1,"Data",A3:B4) | |
| 2 | =RETURN() | |
| 3 | - | |
| 4 | &Histogram | histomacro |
| 5 | | |
| 6 | | |
| 7 | =DEFINE.NAME("da_ta",INPUT("Select Data Range",8,"Data Range Selection")) | get range of values |
| 8 | =IF(GET.NAME("!da_ta")="=FALSE",RETURN()) | end if Cancel |
| 9 | =DEFINE.NAME("distrib",INPUT("Select Distribution Range",8,"Distribution Range Selection")) | get range of distribution intervals |
| 10 | =IF(GET.NAME("!distrib")="=FALSE",RETURN()) | end if Cancel |
| 11 | =SELECT(!distrib) | position to first row |
| 12 | =SELECT("rc[1]") | position to output range |
| 13 | =FORMULA.ARRAY("=sum((da_ta<=rc[-1])*1)") | |
| 14 | =SELECT("r[1]c") | |
| 15 | =FOR("x",1,ROWS(!distrib)-1,1) | for loop |
| 16 | =  FORMULA.ARRAY("=sum((da_ta>r[-1]c[-1])*(da_ta<=rc[-1]))") | enter formula |
| 17 | =  SELECT("r[1]c") | next row |
| 18 | =NEXT() | |
| 19 | =FORMULA.ARRAY("=sum((da_ta>r[-1]c[-1])*1)") | add over upper limit |
| 20 | =SELECT(!distrib) | |
| 21 | =SELECT(OFFSET(SELECTION(),0,1,ROWS(!distrib)+1)) | select the output |
| 22 | =COPY() | convert to values from formulas |
| 23 | =PASTE.SPECIAL(3) | |
| 24 | =CANCEL.COPY() | cancel copy |
| 25 | =RETURN() | end |

**Figure 1:** This macro adds a Histogram choice to *Excel*'s Data menu, which prompts you for a value range and then for an interval range, just as the built-in feature in *1-2-3* does.

HISTOGRM.XLM, listed in Figure 1. When you run the code in A1, a Histogram command appears on the worksheet menu bar's Data menu. This command prompts for an input range and a distribution range, just as *1-2-3*'s /Data Distribution does. The macro then inserts all the correct array formulas and converts them to constants, as you did in your macro.

When you create this macro, assign the name HISTOMACRO to cell A7.

David Paradi
Mississuaga, Ontario, Canada

The absence of a simple histogram command in *Excel* has been a long-standing irritant to many *Excel* users. *Excel* 4.0, which should be shipping around the time this column appears, will finally erase that shortcoming. The upgrade's Analysis Toolpak includes both a Histogram command and a FREQUENCY function. The Histogram command will let you specify an unevenly spaced set of distribution bins and will also give you the options of sorting the output, calculating cumulative percentages, and generating an attractively formatted chart.

The Histogram command creates a set of constants rather than formulas. If you want the results linked to input values, so that when the values change the analysis stays current, you can use the FREQUENCY function. To use it, select the entire area where you want your output to appear, and type the formula

```
=FREQUENCY(input_range,bin_range)
```

where input_range is the column of data to be analyzed and bin_range contains the distribution intervals. Finally, enter the formula as an array by pressing Ctrl-Shift-Enter.

If you stay with *Excel* 3.0, Mr. Paradi's HISTOGRM.XLM will do the job just fine. And if, in addition to naming A7 HISTOMACRO, you define the cell as a command macro and give it a keyboard shortcut, you can invoke the procedure by typing something simple and obvious, such as Ctrl-H.

If you've read the earlier column on this topic (December 31, 1991), you should find Mr. Paradi's macro straightforward. Each of the array formulas built by the loop in A15:A18 examines a pair of logical expressions: "Is the current value greater than or equal to some value" and "Is the current value less than some other value." When both expressions are true, the array tallies a 1; when either is false, it tallies a 0. The SUM function, which embraces the two logical expressions, counts the number of 1s and deposits the result in the current histogram bin.

If you want the macro to leave its array formulas in place rather than converting the results to constants, insert new cells in A20:B20 and bump the rest of the macro down. Then type =RETURN() in A20. And if you want Mr. Paradi's Histogram command to appear automatically on the Data menu whenever the macro sheet is loaded, assign the name Auto_open to cell A1.

Neither Mr. Paradi's macro nor the *Excel* 4.0 Histogram will come anywhere close to the blinding speed of *1-2-3* 2.*x*'s /Data Distribution command, which runs in machine language. But they are respectably quick nonetheless. The Analysis Toolpak's Histogram command in *Excel* 4.0 appears to operate in about 30 percent less time than Mr. Paradi's macro (it could actually be faster than that, judging from an early beta build), so if speed is critical or you have a large range of data to analyze, you'll probably want to use *Excel* 4.0.

## HINTS, TIPS, QUESTIONS

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If you are involved in the management of a point-to-multipoint datacomm network, the GlobalView screen test can make you a star. To learn how dial-up lines can become a technically feasible and economically attractive network choice, ask for GlobalView specifications and a system cost analysis. Contact UDS at 800/451-2369 (in Alabama, 205/430-8000); FAX 205/430-8208.

CIRCLE 367 ON READER SERVICE CARD

UDS

MOTOROLA

by
Frank J. Derfler, Jr.

# Connectivity

## SORTING OUT REMOTE ACCESS OPTIONS

I work for a state agency that has Novell's *NetWare* LANs running on Ethernet spread out in three cities. We're looking for a product that would let workstation users dial out to access bulletin boards and a commercial toxic substance database.

We'd also like the ability to let a system administrator at another site dial in and perform LAN service and support. We might want to let users dial in to the networks from outside, too, though that's not our first concern. Actually connecting the remote networks is attractive but not necessary, either.

We're evaluating LANport II, LANmodem, and NetModem/E, but already decided against the Novell ACS (Asynchronous Communications Server). Although—compared with the others—LANport II is a different animal, it also costs less than remote routers.

What product do I choose? Which will best meet my needs? Do any hold clear advantages?

Bob Sutherland
via CompuServe

The answer to your question is based on two other questions. First, what communications software do you want to use? Some programs can't use modems shared over a network, and this whole class of products might not work for you if you use some special software to query the database service. Second, what kind of modems do the services you will be calling use? If they have high speed V.32 or V.32bis modems, your best bet is to go with LANmodem or NetModem/E. If they only offer V.22bis 2,400-bit-per-second lines, though, you can save about $1,000 per device by using LANport II or a competing device called Central Station with far less expensive modems.

We've had several letters asking about ways to share modems across a LAN and wondering about this new category of

- SORTING OUT REMOTE ACCESS OPTIONS: Alternatives for networking from a distance and how they work.
- 16Mbps TOKEN-RING OVER UTP: The significance of a recent IBM/Synoptics announcement.

products—networked modems—like LANmodem and NetModem/E, so I'll go into more depth.

The $695 LANport II and $1,995 LANmodem both come from Microtest Corp. (602-971-6464). The $2,295 NetModem/E is a product of Shiva Corp. (617-252-6300). You shouldn't overlook a $595 offering in roughly the same category—the Central Station, from Artisoft (602-293-6363).

These products all differ slightly. NetModem/E is a high-speed V.32bis modem with a LAN adapter and no serial port (see First Looks in the November 12, 1991, issue, "Shiva NetModem/E: Well-Connected Modem Provides Dial-In/Dial-Out"). LANmodem is a high-speed V.32bis modem with a LAN adapter and a serial port.

Central Station and LANport II are products I call *special function servers*. Neither has its own modem, but they can host a modem on the network. LANport II has a serial port for the modem and a network port. Central Station includes parallel, serial, and network ports and can perform jobs other than modem sharing. These products each perform differently for incoming calls, but they all work the same way when you want to share modems across the LAN to make outgoing calls.

When Microsoft first fielded DOS, the developers gave it the ability to pass data to serial ports as it does to parallel ports and disk drives. Applications only needed to issue an interrupt 14h to call the operating system's communications services. But DOS was slow, so programmers bypassed it in favor of moving data directly between applications and the serial port hardware. To this day, DOS communications software still works this way. If an application talks directly to the hardware, though, the network redirector—which can only grab requests made to DOS—is powerless to divert the requests to a network modem or communications server.

As a result, you need a communications package that can route data using either interrupt 14 or with a similar call to the Network Asynchronous Server Interface (NASI) developed by Novell. Only a few products (such as *Crosstalk Mk. 4*, *Smartcom III*, and *ProComm Plus Network*) offer interrupt 14 or NASI drivers. It's unlikely that a special program designed to access a remote database or an electronic mail system can use interrupt 14 or NASI (*Lotus Express* for MCI Mail provides one example); consequently, sharing modems across the network might not be for you.

Besides needing the right kind of communications software, any PC that might use shared networked modems must run a redirector for interrupt 14 or NASI. Typically, in the case of the products I've described, you load a TSR of about 20K that moves the data between the network communications software, IPX (in the case of *NetWare*, for example) and the communications program. During the setup, you tell the redirector how to use available shared modems on a first-come, first-served basis.

You might, for example, have long-distance lines with unlimited dialing capabilities and specify (in the interrupt 14 or NASI redirector) a pool of modems connected to them as COM3. Another group of modems, perhaps attached to

private lines going only to different operating locations of your organization, could be assigned to COM4.

Anyone wanting to use a shared modem runs comm software with interrupt 14 or NASI service, selecting the appropriate communications port. The redirector posts a notice if no modem is available, otherwise the operation proceeds normally.

Shiva's NetModem/E works some spectacular sleight of hand, making the whole process appear to take place on a local modem. It digitizes all sounds the modem hears, including dial tones, busy signals, answer tones—even a voice answering the call—then sends them over the network to the caller's PC where they can be heard through its speaker. The activity increases network traffic, but it is impressive!

On incoming calls, LANport II gives the caller a menu of simple file-transfer and printing tasks. Security is tight and operation is simple but flexibility is limited.

Central Station, on the other hand, acts as a remotely controlled CPU on the LAN. A complete computer, it allows remote callers to run all network applications (for which they have rights) on the Central Station. Both of these devices work very well with low-cost, 2,400-bps modems.

The networked modems expect callers to have a full load of networking software on the calling PCs. The calling laptop has a redirected drive F: and possibly other drive letters available and can send print jobs directly to networked printers. This kind of exchange moves a large amount of data, though and you need the fast 14.4-kilobit-per-second service of the V.32bis modems in LANmodem and NetModem/E.

The bottom line? Until more communications programs get interrupt 14 or NASI support, or some company comes out with a hardware product that emulates a serial port and routes data to and from interrupt 14, shared modems will have limited appeal for people calling out. Both networked modems and special function servers work well, though, to meet the needs of incoming callers.

### 16Mbps TOKEN-RING OVER UTP

I'm confused. I read press releases describing an agreement between IBM and Synoptics to field a technology for running 16-megabit-per-second Token-Ring over unshielded twisted-pair wire, but I know that people are doing the same thing in actual installations right now. What's the real significance of the IS announcement?

Ann Zachman
New York, New York

Even telecommunications and connectivity professionals in large corporations are confused, so it seems likely that many of you are either asking the same thing or shrugged off the early November announcement by IBM and Synoptics as just so much hi-tech PR. The ramifications of this announcement, though, can impact your future LAN wiring plans.

The reasons behind the mushrooming popularity of unshielded twisted-pair wiring (UTP) for both Token-Ring and Ethernet have never been persuasive to me. You can get all the benefits of centralized network management and a star wiring plan from systems using coaxial cable or shielded twisted-pair—at about the same system cost and with less risk—but the success of UTP products is evident.

Many installations run 4-Mbps Token-Ring over UTP. When you try to move the token at 16 megabits per second, though, technical requirements for the cable become much more restrictive. That's why you need to use a device like the Microtest Next Scanner (described in the February 25, 1992, Connectivity column) to measure the electrical characteristics of your cable plant. Typically, organizations trying to put 16-Mbps Token-Ring adapters on UTP find that they can only activate a small number of nodes at a time and then, only on short wire runs.

The IBM and Synoptics announcement proposes to break the UTP wiring system electrically into small hunks by installing a retiming circuit on every port of the wiring hub or concentrator. When you treat every node-to-concentrator wire run as a separate link, the noise and distance tolerances start over again for each link rather than accumulating. Because each link is completely separate, they can stretch further with less risk of the entire ring stopping from someone turning on the one node attached by the one cable run that finally breaks the network's back.

The ramifications of this announcement bring good news, bad news, and interesting news for managers in organizations with Token-Ring LANs. The good news is that it will lead to products with increased reliability and the technology will become part of the IEEE 802.5 standard. On the downside, products conforming to this standard will cost more, early offerings from vendors might be incompatible, and some companies will be slower than others to bring out concentrators with the new capabilities.

The interesting news comes from considering why you want 16-Mbps Token-Ring anyway. The typical office LAN—Ethernet or Token-Ring—loafs along using only a small percentage of the available bandwidth. In most office installations, managers will elect to use the 16-Mbps ring only as a backbone between the 4-Mbps wiring centers.

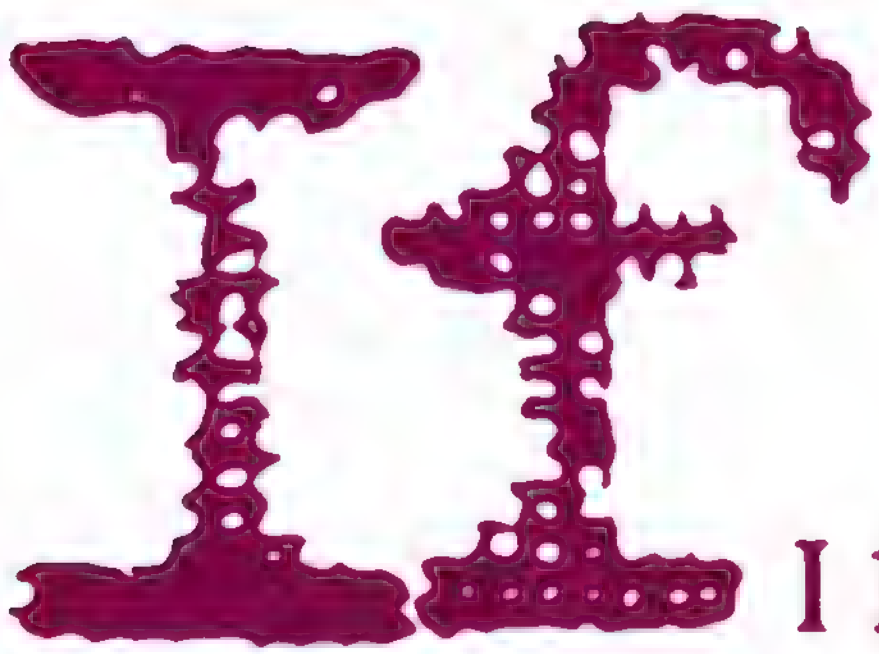
When your organization runs applications that really need bandwidth, however (typically something using imaging), then the step up to 16 Mbps signaling probably isn't enough. The late 1991 trade shows were jammed with products supporting the 100-Mbps FDDI technology. In the overall wiring budget, pulling fiber only costs a few cents per foot more than pulling UTP, and fiber does so much more. FDDI products will continue to drop in price over the next year and in many installations FDDI will eclipse 16-Mbps Token-Ring.

Just as a hint, if you're in one of those organizations downsizing from mainframe systems to a rich LAN mixture of PCs and graphics workstations, Thomas-Conrad can give you 100-Mbps LAN connectivity over the RG-62 coaxial cable you installed for your IBM 3270 SNA terminals—and you won't pull any new wire.

While the retiming technique announced by IBM and Synoptics will make 16-Mbps Token-Ring more robust, other evolving technologies deliver much more bandwidth at prices that will at least land in the same ballpark.

### NETWORK YOUR QUESTIONS

Connectivity gives you practical solutions to networking problems of all types. We'll pay you $50 for any tip that we print. Please submit your letter on-disk along with a printout. Mail your contribution to Connectivity, *PC Magazine*, One Park Avenue, New York, NY 10016. You may also contact Frank J. Derfler, Jr., via MCI Mail (MCI ID: 240-2931) or the LAN Labs fax machine (904-267-1578). We regret that we're unable to answer letters individually. ■



I have to listen to one more minute of small talk I'm going to spontaneously combust, Brad thought to himself as he reached for another canape. And then he saw her.

It was the exotic brunette he'd seen at the intersection. And he knew he had to meet her.

His heart was pounding as he worked his way across the crowded room. Their eyes met and she smiled in recognition. And then she said in a sultry voice,

Did

you ever call
CompuAdd Express?"

**Before** Brad could answer, a guy in a lime green leisure suit blurted out, "CompuAdd Express? That wild computer company in Texas? Boy, do they make great computers!"

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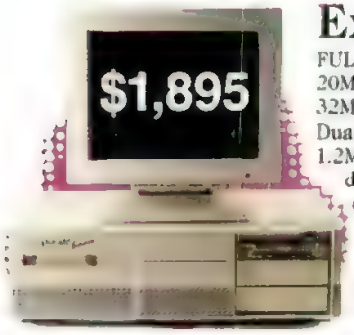
**Some** guy in a turban with a jeweled cigarette holder added, "Talk about fast. They had my computer shipped out within two working days!"

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**"You** know they used to be part of CompuAdd. But they wanted to put more in a computer and sell it for less. So they started their own company," the gentleman with the bad toupee stated emphatically.

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**They** were joined by a woman with a tattoo who was wearing a taffeta gown. "But did you know CompuAdd Express guarantees all their products and backs them with toll-free technical support?" she asked.

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**Brad** knew he had to regain control of the situation if he ever hoped to talk to the exotic brunette again. But before he could speak, she smiled at him and said, "I love a system that comes with all the extras, don't you?"

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# Does

Brad finally get to have a moment alone with the exotic brunette? Will he ever find out what her name is? Will he just give up? Or will he go home and call CompuAdd Express?

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CompuAdd Express

CODE 358

by
Scott McGrath

# PC MagNet

## AUTOMATED ACCESS SOFTWARE, PART 1

Even if logging on to CompuServe and ZiffNet meant simply braving the cold prompt of these on-line services, using them might still be intimidating enough for the newcomer. But in addition to the unfriendly interface that is your gateway to these services, you must also consider the running meter, which produces a somewhat sinking feeling while you're on-line: Time is money.

Fortunately, several ZiffNet- and CompuServe-specific communications software packages exist—some of them shareware, some free, some commercial, and all priced under $100—to help you get the most value from your on-line time. For all but the most casual access to the network, these programs are as indispensible as your modem. The best of them get you on- and off-line with a strict regard for your connect time, increase the quality of the time you spend on-line, and give you a user-friendly interface.

Here, I'll describe two programs well suited to the casual user: the ZiffPlus scripts for use with *ProComm Plus* and *CompuServe Information Manager* (*CIM*). Next time, we'll look at the more dedicated autonavigation programs.

All of the programs and scripts provide the basic accessories needed to access forums and other services. Each package provides some degree of access to forum message sections and download libraries. Each package also offers a *chat mode* for use with on-line conferences, terminal emulation for less predictable services such as the ZiffNet News menus and CompuServe's Electronic Mall, and typically some mechanism for adjusting your default on-line settings, forum membership options, and general preferences. Each implements CompuServe's excellent B+ download protocol for file transfers, an efficient protocol that uses 1,024-byte blocks and features a resume feature for interrupted downloads. CIS-B+ is usually the protocol of choice anywhere on these services.

**AUTOMATED ACCESS SOFTWARE, PART 1: How to improve your interactions with ZiffNet and CompuServe by using navigation software.**

If you're a *ProComm Plus* user, one of the most economical ways to get started is to download ZiffPlus from the PC MagNet Utilities/Tips Forum (GO ZNT: UTILFORUM). The file is ZIFF.ZIP, and is located in Library 11, CIS Navigation Utilities, where you will find most of the software discussed here. These free scripts (written entirely in *ProComm*'s Aspect script language) provide an attractive menu-driven interface to ZiffNet services like the SoftLib and Magazine Review Database, and they also provide a scripted approach to reading forum messages and downloading files. While not as comprehensive as most of the other products under discussion, ZiffPlus does allow you to customize its forum selection menu and is a quantum leap above using raw *ProComm* for CompuServe and ZiffNet access. You might also want to take a look at some other *ProComm* scripts in the CIS Navigation library; there are some in PLUS2.ZIP that make downloading a file from PC MagNet simpler. If you want to explore a variety of scripts available for *ProComm* navigation, at any UTILFORUM library prompt, type BRO KEY:PROCOMM LIB:11.

CompuServe's own *CompuServe Information Manager* is somewhat like the *Microsoft Works* of CIS access software. *CIM* comes packaged with CompuServe's subscription kit, but it's also available separately. (Type GO CIS:CIM to order.) It's an especially friendly application for novices and occasional users of the service, and is currently the only major player to implement CompuServe's Host Micro Interface (HMI) seriously.

*CIM* allows you to create a list of "favorite places," including frequently visited forums and services, and provides a windowing, CUA-compliant, menu-driven approach to navigating from one place to another. You can mark messages of interest for off-line perusal and reply, browse file-download libraries with ease, and obtain graphical views of the weather services and image files. *CIM* also has an especially attractive interface for on-line conferences.

Perhaps its greatest quality is the way it helps you explore unknown areas. *CIM* has unique features that assist you in looking for items of interest and in examining news features such as Newsbytes, service announcements, special offers, contests, and databases. Its features for joining a forum are very simple. When you arrive at a forum you haven't yet visited, the program asks you whether you wish to join. With an affirmative answer, your name is registered on the forum (an action without any particular obligation done routinely when first entering a forum), and you are then free to access its message boards and file download libraries.

Configuring *CIM* is also straightforward. The program stores global options that you have set in dialog boxes called by the menus, and it asks for a user ID, password, any specially required modem settings, and a local node phone number. *CIM* does have some shortcomings, however. It is not as conscientious about minimizing on-line time, particularly with regard to download libraries, and it lacks some advanced features.

In the next issue, we'll look at *TAPCIS*, *AutoSIG*, and *CISOP*, which go a lot further to reduce the time you spend on-line; they also provide sophisticated off-line processing. If you plan to participate in forums regularly, you'll probably want to use one of these programs. ■

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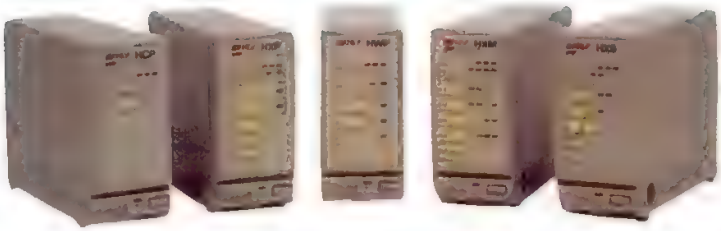

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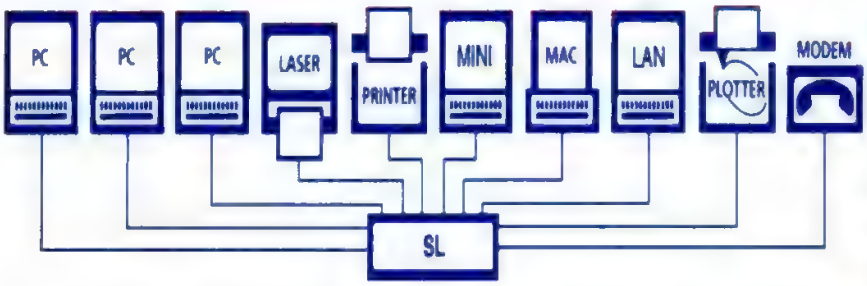


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CIRCLE 328 ON READER SERVICE CARD

by
Philip B. Eskelin, Jr.

# Utilities

## WPRINT Lets You Print Easily In Windows 3.1

How do you print a bitmap? If you're like most Windows users, you probably run Paintbrush, select the File Open command, display the bitmap you want to print, and finally choose Print. To print a text file, most likely you go through a similar process. But this can take more time and trouble than it's worth. Printing in Windows should be simple. And with WPRINT, it finally is.

WPRINT, a Windows 3.1-specific utility, lets you print a text or bitmap file in just one easy step. Simply click on the file you wish to print, drag it to the WPRINT icon, and release the mouse button. *Voilà!* WPRINT prints your file.

You can get a copy of WPRINT.EXE from PC MagNet, as explained in the sidebar "Downloading Utilities." To get the C source code files as well as the executable, download WPRINT.ZIP. For people who don't have a modem, the source code is available by mail or fax; just send a postcard with your name and address to the attention of Katherine West, Utilities, *PC Magazine,* One Park Avenue, New York, NY 10016; no phone calls, please. To compile the source code, you will need Microsoft C 6.0 and the Windows 3.1 SDK.

### USING WPRINT

You can execute WPRINT by choosing Run from Program Manager's File Menu and entering at the command line

```
d:\path\WPRINT.EXE
```

where *d:* is the drive and *path* specifies the directory in which WPRINT is located. However, the best way to use WPRINT is to copy it to your Windows directory and add it to a program group by choosing New from the File menu in the Program Manager. Once it's installed, you simply double-click on the WPRINT icon and it will appear minimized at the bottom of your desktop.

To use WPRINT, simply click on any text or bitmap file from within File Manager and drag the file to the WPRINT icon. When the cursor changes to what looks like a dog-eared piece of paper with cross hairs in the middle, release the mouse button. WPRINT will print your file.

■ Our first Windows 3.1 utility takes advantage of the upgrade's drag-and-drop functionality to make printing a snap.

WPRINT becomes even more of a timesaver when you print multiple files. From within File Manager, choose File | Select Files and, for example, select all .TXT files. Then close the dialog box, click on one of the selected files, and drag it to WPRINT. Your files will be printed and you can continue to work on other tasks.

### HOW WPRINT WORKS

One of the greatly anticipated features of Windows 3.1 is its drag-and-drop functionality. While Windows 3.0's File Manager had a similar feature, it was usable only for dragging files into Program Manager when a new program icon was being created. To write WPRINT, I implemented this drag-and-drop functionality. Let's take a look at how it works.

When the user begins dragging with the mouse after selecting a file—or files—File Manager calls SetCapture() so that it can receive all mouse input, regardless of the position of the cursor. Once the mouse cursor is out of the boundaries of the File Manager window, File Manager checks to see whether the application under the mouse cursor has registered to accept files. An application registers to accept files by calling the DragAcceptFiles() function after the parent window has been created. The code in Figure 1 shows how WPRINT registers to accept files from File Manager.

Next, File Manager receives a WM_MOUSEMOVE message every time the mouse is moved, and it checks to see what the handle of the window is at the coordinates of the mouse. If the point is in the client area of a window that has been registered by way of the DragAcceptFiles() function, then the cursor changes to the previously described cursor. Once the user releases the mouse button, File Manager calls ReleaseCapture(), destroying the previous SetCapture(), and sends the receiving application a WM_DROPFILES message.

When WPRINT receives the WM_DROPFILES message, it calls the DragQueryFile() function as shown in Figure 2. Notice that the second parameter of DragQueryFile() is set to -1 the first time it is called. This tells DragQueryFile() to return the number of files that the user selected in File Manager.

The filenames are stored in a zero-based list, so WPRINT enters a loop in which the variable *i* runs from 0 to one less than the number of files. Within the loop, another call to DragQueryFile() passes the value of *i* instead of -1, causing DragQueryFile() to place the name of each file in turn into the third parameter of DragQueryFile(), which is a character

THE INITINSTANCE() FUNCTION

```
/* InitInstance() is called from WinMain(). It creates the
   frame window, and customizes the WPRINT system menu.  Then,
   it registers with the File Manager as a file-accepting
   application by calling DragAcceptFiles().  Finally, it shows
   and updates the WPRINT window by calling ShowWindow() and
   UpdateWindow(). */

BOOL InitInstance(HANDLE hInstance, int nCmdShow)
{
     HWND              hWnd;
     HMENU             hMenu;

     hInst = hInstance;

     /* Create frame window */

     hWnd = CreateWindow("WinPrint","WinPrint",
                         WS_OVERLAPPEDWINDOW,
                         CW_USEDEFAULT,CW_USEDEFAULT,0,0,
                         NULL,NULL,hInstance,NULL);

     if (!hWnd)
          return (FALSE);

     hWndParent = hWnd ;

     /* Customize the system menu */

     hMenu = GetSystemMenu (hWndParent, 0);

     AppendMenu (hMenu, MF_SEPARATOR, 0, NULL);
     AppendMenu (hMenu, MF_STRING,
                 IDM_SETTINGS,"&Settings...\tF5\0");
     AppendMenu (hMenu, MF_STRING, IDM_PRINT, "&Print
                 file...\tF6\0");
     AppendMenu (hMenu, MF_STRING, IDM_ABOUT, "A&bout
                 WPRINT...\tF1\0");

     RemoveMenu (hMenu, SC_MINIMIZE, MF_BYCOMMAND);
     RemoveMenu (hMenu, SC_MAXIMIZE, MF_BYCOMMAND);
     RemoveMenu (hMenu, SC_SIZE, MF_BYCOMMAND);

     /* Register to accept files from File Manager */

     DragAcceptFiles(hWnd, TRUE);

     /* Show WPRINT */

     ShowWindow(hWnd, SW_SHOWMINIMIZED);
     UpdateWindow(hWnd);
     return (TRUE);

}
```

**Figure 1:** Here's how WPRINT registers to accept files from File Manager.

string, szDropName, that's big enough to hold any path and filename. It is passed to the next function, PrintFile(), which takes the filename stored in szDropName and prints the file.

I was curious to know the problems File Manager's designer encountered implementing this dragging facility, so I created my own simple file management utility. It did not contain all of the file and disk functions that are included in File Manager, as my primary focus was to discover a way to drag files from one application to another.

I created a multicolumn list box as a child of the parent window. The list box contained all of the files and subdirectories in the current working directory. My first problem was what to do when the user selected a file and proceeded to drag with the mouse. My solution? Subclass the list box, as shown in Figure 3.

*Subclassing* is the process of changing the window procedure instance stored in the window data structure to that of your own window procedure instance. This lets you intercept all Windows messages in a created window before they are given to the original window's procedure instance; this, in turn, lets you do what you want with any message. Messages you do not wish to intercept may or may not be passed to the previous window procedure (you can control this, since your new window procedure governs whether or not any message is sent to the original window's procedure).

To get the window procedure address I used the GetWindowLong() function and saved it in the global variable lpfnOld (the new subclass window procedure I created in Figure 3 uses this value to call the original window function). Windows automatically makes a procedural instance for a class when it is created; therefore, making a procedural instance of the new subclass window procedure using the MakeProcInstance() function was a necessity.

Finally, I set the window procedure address to the new procedural instance of the subclass list box window procedure using the SetWindowLong() function.

Having subclassed the list box, I could intercept the WM_LBUTTONDOWN, WM_MOUSEMOVE, and WM_LBUTTONUP messages. So now when the user selects the files in the list box, the SetCapture() function lets the list box window capture all mouse input. Hence, the list box gets all WM_MOUSEMOVE messages even when the mouse is outside of the client area of the list box. Inside the subclass window procedure, you may notice that bCallProc is set to TRUE initially, and is changed only when there is a WM_MOUSEMOVE or a WM_LBUTTONDOWN message. Setting bCallProc to FALSE means the original window's procedure is not sent the message; therefore, the original list box window's procedure gets all messages except the WM_MOUSEMOVE and WM_LBUTTONDOWN messages.

Every time the list box receives a WM_MOUSEMOVE message and the left mouse button is down, QueryDragDrop() is called. QueryDragDrop(), as shown in Figure 3, sends the application the DRAG_GET_HANDLE message at the mouse point.

If at this point, upon receiving the message the application returns its window handle, then QueryDragDrop() returns that handle value to ListBoxWndProc(). (Note that the SendMessage() function returns a long value, which is where the target application places its window handle.)

If the top-level window handle at the point of the mouse cursor and the value returned from the message sent are equiva-

THE DRAGQUERYFILE FUNCTION

```
/* In the switch statement for WPRINT's window messages, we
   do the following when a WM_DROPFILES message is recieved */

switch (msg){

     case WM_DROPFILES:
          /* Call DragQueryFile() passing -1 in the second
             parameter. It returns the number of files dragged. */

          wNumDrop=DragQueryFile(wParam,-1,szDropName,128);

          /* Now, loop wNumDrop times.  DragQueryFile() interprets
             i as an index to the list of files that were selected
             from File Manager.  It copies the full filename and
             path into the character array szDropName specified in
             the third parameter. */

          for (i = 0; i < (int) wNumDrop; i++) {
               DragQueryFile (wParam,i,szDropName,
                              sizeof(szDropName));
               if (!PrintFile (szDropName))
                  break;
          }

      break;

}
```

**Figure 2:** This code excerpt shows how the WPRINT utility gets and prints a file dragged from File Manager whenever a WM_DROPFILES message is received.

lent, then the cursor is changed in order to notify the user that he can let go of the mouse button. When the WM_LBUTTONUP message is received, the list box proceeds to post a message to the receiving application; this message contains special information, which the application must be coded to take advantage of. The following illustrates how the message is posted:

```
PostMessage (hWndTarget,
WM_COMMAND, DRAG_NOTIFY_WINDOW,
MAKELONG(hFileArray, nFiles));
```

The low word of the long value contains the global, shareable array of strings. Each string is a file selected in the list box. The high word contains the number of strings in the array. Figure 3 contains an example of how an application receiving the message might react.

There are other ways that the file dragger I created could communicate with another application. One way might be to use the RegisterWindowMessage() function supplied by Windows. The message created is guaranteed to be unique (within the range of 0xC00 to 0xFFFF), but does not stand at a constant value (as WM_DROPFILES does for the File Manager dragging system).

### PRINTING

Printing in Windows is often perceived as being complex. However, all it takes is mastering the fundamentals. From a design point of view, WPRINT:

- Displays a dialog box stating that the program is printing and gives the user the ability to cancel;
- Disables any input to the window so that the user cannot exit WPRINT while printing;
- Gets the device context of the printer;
- Sets the abort procedure so that messages can be processed while printing;
- Starts the printing session;
- Makes all of the graphics calls to the printer device context that go onto the current page;
- Lets the GDI know that it is finished drawing on the current page so that it can

SUBCLASSING A LISTBOX — 1 OF 2

```
$define DRAG_GET_HANDLE        $xFFFE
/* I use this to check the position of the cursor with respect
   to the screen, then I find the top level parent window, then I
   send it a message as follows:

$endMessage (hwndAtPoint, WM_COMMAND, DRAG_GET_HANDLE, $L);

The application upon recieving this message merely
returns the handle to its parent window, for example:

case WM_COMMAND
     switch (wParam)
          case DRAG_GET_HANDLE:
               return hWnd;
*/

$define DRAG_NOTIFY_WINDOW     $xFFFF
/*
I POST this message to the recieving application, in this form:

PostMessage (hwndAtPoint, WM_COMMAND, DRAG_NOTIFY_WINDOW, lData);

lData contains the number of strings in the high order word
of the long value, and contains the handle to the memory block
containing the array of filenames.  The array of filenames
(strings) is unlocked and marked as shareable.  This is what the
recieving application might do:

case WM_COMMAND:
     switch (wParam){
          case DRAG_NOTIFY_WINDOW:
               hMem = LOWORD (lParam);
               lpMem = (char *) GlobalLock (hMem);
               for (i=$ ; i < (int)HIWORD(lParam) ; i++){
                    /* lpMem[i] gives you the ith index
                       into the array.
                    */
               }
               GlobalUnlock (hMem); GlobalFree (hMem);
               break;
     }

*/

/* ListBoxWndProc() is an example of a subclassed listbox
   function.  In the switch condition, we can intercept windows
   messages, then call or not call the original listbox window
   function.  The variables bButtonDn, holdCursor, hDragCursor,
   hWndList, hInst, lpfn, and bDrag are all external variables
   that are declared in another module. */

long FAR PASCAL ListBoxWndProc (HWND hWnd, unsigned message,
   WORD wParam, LONG lParam)
{
LONG lResult = $ ;
BOOL bCallProc = TRUE;

switch (message){

     case WM_LBUTTONDOWN:
          /* Notice bCallProc does not get changed because the
             original listbox windows procedure needs to
             recieve button down and up messages as
             different items in the listbox are selected. */
```

**Figure 3:** Subclassing lets you intercept all the Windows messages in a created window before they are given to the original window's procedure instance. You can then do what you want with them. Messages you do not wish to intercept can be passed on as normal. Notice that we are changing the address of the window procedure in the window data structure, not the class data structure; therefore, this does not affect any other list boxes created from the LISTBOX class.

## SUBCLASSING A LISTBOX



```
        hOldCursor = LoadCursor (NULL, IDC_ARROW);
        hDragCursor = LoadCursor (hInst, "DragCursor");
        bButtonDn = TRUE;
        break ;

    case WM_MOUSEMOVE:
        if (bButtonDn){
            bDrag = TRUE;
            /* as soon as the mouse is moved, a dragging is
               assumed, so we set capture in order to recieve
               all mouse input. */
            SetCapture (hWnd);
            if ( QueryDragDrop (hWndList, MAKEPOINT(lParam))
                 != NULL)
                 SetCursor (hDragCursor);
            else
                 SetCursor (hOldCursor);
            /* we set bCallProc to FALSE so that the original
               listbox windows procedure does not get
               notification of a mouse movement when dragging */
    bCallProc = FALSE;
        }
        break ;

    case WM_LBUTTONUP:
        if (bDrag){
            bDrag = FALSE;
            SetCursor (hOldCursor);
            ReleaseCapture();
            ProcessDrop (lParam);
        }
        bButtonDn = FALSE;
        break ;

    default:
            break ;
    }

    /* If bCallProc is TRUE, call the original listbox windows
       procedure by way of the CallWindowProc() function. lpfn
       is the procedure instance we got after the listbox was
       created. */

    if (bCallProc)
        lResult = CallWindowProc (lpfn, hWnd, message, wParam,
                                  lParam);
    return lResult;
    }


    /* QueryDragDrop() gets the window handle from the point of the
       mouse pointer, finds the top-level parent (the window below
       the point that does not have a parent), sends that window
       procedure a DRAG_GET_HANDLE message, and if the handle
       returned is equivalent to hwndDrop, then we return that
       handle back to ListBoxWndProc() */

    HWND QueryDragDrop (HWND hwnd, POINT pt)
    {
    HWND hWndDrop, hWndTop, hwndResult;

    ClientToScreen (hwnd,(LPPOINT)&pt);

    hWndDrop = WindowFromPoint(pt);

    /* Get the parent window handle at the point */
    while ((hWndTop = GetParent (hWndDrop))!=NULL)
        hWndDrop = hWndTop;

    hwndResult = (HWND) SendMessage (hWndDrop, WM_COMMAND,
                                     DRAG_GET_HANDLE, 0L);
    if (hwndResult == hWndDrop)
        return hwndResult ;
    else
        return NULL;
    }


    /* ProcessDrop() checks to see if QueryDragDrop() returns
       a valid window handle at the point where the user
       up-clicked with the mouse, then posts a message containing
       the filename data to the target application */

    void ProcessDrop (LONG lParam)
    {
    HWND hWndDrop;

    /* Get the window handle where the mouse was up-clicked */
    hWndDrop = QueryDragDrop (hWndList, MAKEPOINT(lParam));

    if (hWndDrop == NULL)
        return;

    /* Give the application the message and the long value returned
       from GetSelStrings().  GetSelStrings() just gets all of
       the selected items in the list box, and puts the
       filenames into a global shareable array of strings.  The
       handle to this array and the amount of selected items are
       put into one long value, which is returned. */
    PostMessage (hWndDrop, WM_COMMAND, DRAG_NOTIFY_WINDOW,
                 GetSelStrings (hWndList));
    return;
    }
```

send output to the printer device driver and begin the next page; if banding is supported, then it addresses all of the bands on the entire page;

- Repeats the previous two steps if there are multiple pages to be printed;
- Ends the printing session.

You can use the same graphics functions for the printer that you would use for the screen. However, you still must create a device context for the printer. To do this, call the GetPrinterDC() function, which creates a device context based on the current WIN.INI settings as shown in Figure 4.

The WIN.INI file contains a section that looks like the following:

```
[windows]
;
device=PCL / HP LaserJet,
HPPCL,LPT1:
;
```

The windows function GetProfileString() will fill the string szPrinter with everything to the right of the keyname DEVICE= in the [Windows] section of the WIN.INI file. The first parameter is Windows, which specifies that I want to look at the [Windows] section of the WIN.INI file. (Note that \0 is the terminating NULL character, or ASCII zero.) The second is device, which chooses the DEVICE= key within that section. The third is the default value; if no DEVICE= key is found, set it to ",,,". The fourth parameter is the string buffer where the function places the result, and the fifth specifies the size of the maximum length I will accept.

### THE GETPRINTERDC() FUNCTION

```
/* GetPrinterDC() gets the printer settings from the "device="
   keyname in the "[windows]" section of the WIN.INI. It then
   creates a device context and returns its handle */

HDC GetPrinterDC (void)
{
char szPrinter [80];
char *szDevice, *szDriver, *szOutput;

if (!GetProfileString ((LPSTR)"windows\0",
                       (LPSTR)"device\0",
                       (LPSTR)",,,\0",
                       (LPSTR)szPrinter, 80))
     return NULL;

if ((szDevice = strtok (szPrinter, ",")) &&
     (szDriver = strtok (NULL,      ",")) &&
     (szOutput = strtok (NULL,      ",")))
       return CreateDC (szDriver, szDevice,szOutput, NULL);

return NULL;
}
```

**Figure 4:** This function creates a device context based on the current WIN.INI settings.

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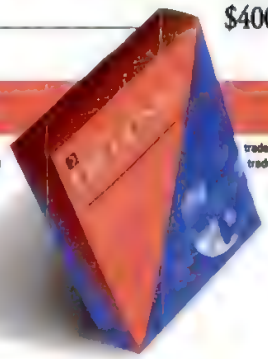

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CIRCLE 239 ON READER SERVICE CARD

**THE ESCAPE IDs USED IN WPRINT**

| Escape ID | Description |
|---|---|
| STARTDOC | Starts a document printing session |
| SETABORTPROC | Sets up a pointer to an abort procedure |
| ABORTDOC | Aborts the printing of a document |
| NEWFRAME | Causes GDI to translate drawing commands to the printer output and begin a new page |
| NEXTBAND | Gets the dimensions of the next band for printing |
| ENDOC | Ends the document printing session |

**Figure 5:** The Escape() function allows access to some printer features that are not directly available through GDI; they are translated into printer-specific commands and then sent to the printer driver.

If there is no setting found, the string ",,,\0" is put into szPrinter. Once I parsed out the information into the device name, the driver name, and the output port, I could create the printer device context based on these settings by calling the CreateDC() function.

The syntax for this function is

```
CreateDC (lpDriverName,
 lpDeviceName, lpOutput, lpInitData)
```

where lpDriverName is the name of the driver file, lpDeviceName is the name of the device (like "PCL/HP LaserJet"), lpOutput is the output port (like "FILE:," "LPT1:," or "COM1:"), and lpInitData is a pointer to a DEVMODE structure (which we set to NULL). The fourth parameter to CreateDC() can be a pointer to a DEVMODE data structure (containing device-specific information for the driver). However, setting it to NULL tells the CreateDC() function to use default initialization settings (the information specified in the Control Panel, in the printer's case). In addition, the call to CreateDC() loads the printer driver into memory, if it is not already there.

#### USING THE ESCAPE() FUNCTION

Once this device context is created, I can make graphic calls just as I would with a display device context—well, almost. The main difference is that to interact with the printer successfully, I must use Escape(), which the GDI uses to interact with the printer driver. The syntax is

```
Escape (hDC, nEscape, nCount,
 lpInData, lpOutData)
```

The hDC parameter is the printer device context created by GetPrinterDC(). nEscape is an escape ID (the IDs used here are discussed below). nCount is the size of the data (if any) passed in the lpInData parameter. lpInData points to input data for escapes that require it. And lpOutData points to a buffer to receive output from escapes that produce output.

For instance, calling Escape() with the second parameter set to NEXTBAND places the band dimensions in the buffer pointed to by the lpOutData parameter (banding is described below).

Escape() allows access to printer features not directly available through GDI; they are translated into printer-specific commands and then sent to the printer driver. Some of the ones I will use are shown in Figure 5 (for a more complete explanation, refer to Chapter 12 in the Microsoft Windows *Guide to Programming* included with the SDK). Of this list, the NEWFRAME value is of particular importance. Passed as the second parameter to the Escape() function, it tells the GDI to translate all drawing commands and go to the next page. This can take a lot of memory when printing bitmaps—probably more than the printer may have—if the bitmap is large. This is where *banding* becomes important.

#### BANDING

Banding is the technique of printing an image by dividing the image into several bands (or rectangles), and sending each band output to the printer separately. Banding has many advantages, with the most important one applying to bitmaps. Normally, the GDI uses a metafile to store all

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of the drawing information. Then it plays the entire metafile for each band destined for the printer. (A *metafile* is a file of instructions to draw an image; a *bitmap* is a collection of individual pixels that define an image.) This step is bypassed by banding. Banding sends the output for each band directly to the printer, thereby increasing printing speed and reducing disk space required for printing, especially when printing bitmaps. WPRINT makes use of banding when it prints bitmaps.

Passing NEXTBAND as the second parameter to an Escape() function call will tell the GDI to put the band dimensions into the pointer to the RECT data structure passed in the fourth parameter to Escape():

```
Escape (hdcPrn, NEXTBAND, 0,
  (LPSTR)NULL, (LPRECT) &rect);
```

(The variable *rect* contains the dimensions after the call to Escape() returns.)

One very important note: If you call Escape() with NEXTBAND to draw each band on the page, you should not call the NEWFRAME escape. NEXTBAND processes the printer output as you draw to the printer. In contrast, NEWFRAME tells GDI to process calls for that page, since no other escapes need to be made after the STARTDOC escape.

#### THE ABORT PROCEDURE

SETABORTPROC is the function that processes messages and dispatches them to the print dialog box (displayed while printing) or to other windows in the application. It also allows other programs to get and handle their own messages while WPRINT is printing. WPRINT makes a procedural instance before printing and frees it after printing is successfully completed. You should call the abort procedure in between drawing calls while in the print loop.

#### EXAMPLE OF PRINTING WITH BANDING

The code excerpt in Figure 6, taken from PRINT.C, exemplifies the basics of printing a bitmap using the banding method. Before this code, I created the printer device context, set up the abort procedure (made a procedural instance), disabled the WPRINT window, and displayed the dialog box allowing the user to cancel the printing. Also, if you investigate PRINT.C for WPRINT further, you will notice that, depending on which settings the user has currently selected for bitmap printing (via the Settings menu option), WPRINT sets up a RECT data structure with the logical coordinates of the bitmap size on the page. Then, when it is time to talk to the GDI with drawing calls, WPRINT uses the StretchDIBits() API call to give the bitmap to the printer device context.

While this does not give a full illustration of what you need to do, it does cover the basics of printing itself. At the end of the print function, I clean up things by reenabling the WPRINT window, destroying the print dialog box, freeing the procedure instance for the abort procedure, and deleting the printer device context.

#### PRINTING WITHOUT BANDING

WPRINT does not use banding if it is to print a text file. WPRINT first tries to open the file dragged as a device-independent bitmap. If an error occurs, then it assumes the file is a text file and tries to print it accordingly. Notice that the function in PRINT.C that prints text files does not band at all.

Instead, the Escape() function is called with NEWFRAME as the second parameter after all the lines of text that will fit on the page have been written. This is the indicator to the GDI to process the drawing calls for that page and to start a new one. Other than this indication, which banding doesn't need, the basics of printing are the same.

#### PRINTER SETTINGS

The last thing I would like to talk about is how to bring up that printer setup dialog box. Usually, to get printer settings via the Control Panel under Windows 3.0,

WPRINT.C — PARTIAL LISTING

```
/* This is a code excerpt from WPRINT which illustrates the necessary
Escape() calls in order to print by banding */

wsprintf ((LPSTR)szMessage, "printing: %s", (LPSTR)filename);

if (Escape hdcPrn, STARTDOC, sizeof(szMessage)-1, szMessage, Null)>0){
     RECT BandRect;

     Escape (hdcPrn, NEXTBAND, 0, (LPSTR)NULL, (LPSTR)&BandRect);

     /*
      * If the rectangle for the band is not empty, and the
      * user has not pressed the cancel button, then go for it.
      */

     while (!IsRectEmpty(&BandRect) && !bUserAbort){

          /* Convert the points to logical points */

          DPtoLP(hdcPrn,(LPPOINT)&BandRect,2);

          /* Make a call to the abort procedure (described above)
             to check for cancellation, and let other things
             happen. */

          (* lpfnAbortProc)  (hdcPrn, 0);

          /* Here, we are ready to make the desired drawing
             calls.  These calls can be directed to the entire
             document, or just the current band (via the band
             dimensions found above) */

          /* find out the dimensions of the next band */

          Escape(hdcPrn,NEXTBAND,0,(LPSTR)NULL,(LPSTR)&BandRect);      }
}
else
     /* if the escape to start the document failed, call the
        cops. */
     bError = TRUE;

     /* Tell GDI to tell the device driver that we are done with
        the print job. If error happened, then no need to end
        document. */

if (!bError) Escape (hdcPrn, ENDOC, 0, NULL, NULL) ;
```

**Figure 6:** This code excerpt shows the basics of printing a bitmap using the banding method.

you execute Control Panel, double-click on the printer icon, click on the Configure button, and click on the Setup button. With WPRINT, by comparison, all you do is choose the Settings menu option, then click on the Printer Setup button.

As I did when I created the printer device context, I query the WIN.INI file for the name of the device, the output port, and the filename of the printer device driver. Then I attempt to load the printer device driver by calling the LoadLibrary() function, passing the name of the printer driver file. A printer device driver is just a dynamic link library with a special purpose: to interact directly with the printer associated with that driver.

Next, I get the procedure instance address of the function called DeviceMode(). DeviceMode() is an exported function by each printer device driver that is used to call up the settings dialog box. Its syntax looks like this:

```
DeviceMode (hWnd, hLibrary,
  lpDeviceName, lpOutputPort);
```

hWnd is the window handle of the window that should own the dialog box that will be displayed. hLibrary is the handle returned by the LoadLibrary() function previously called. lpDeviceName is the name of the device (that is, for example, HP LaserJet Series II); the DEVICE= setting in the [Windows] section of the WIN.INI file contains the device name. And lpOutputPort is the port name (that is, COM1: or FILE:).

> WPRINT is a very simple utility that can make a tedious task into a simple drag-and-drop task.

Using the address of the pointer returned by the GetProcAddress() function, I make a far call to the DeviceMode() function in the driver. Aside from the appropriate error checking, that is all that is necessary to bring the printer settings dialog box up. The last thing of importance is to notify all currently running applications that the printer settings in the WIN.INI file might have been changed by sending a message using the following format:

```
PostMessage ((HWND) 0xFFFF,
  WM_WININICHANGE, 0, (LONG)NULL);
```

The wParam parameter of this message does nothing; however, lParam (fourth parameter) is a pointer to a string naming the section of the WIN.INI that has been changed. Setting it to NULL means that each application should check the entire file for any applicable changes. I did not specify a certain section (like the [Windows] section) because it is possible to make printer setting changes that alter several sections of the WIN.INI file (for instance, changing downloaded printer fonts alters the printer settings section rather than the [Windows] section).

When a printer settings dialog box comes up and you make changes to the configuration of the printer, it records these settings in the WIN.INI file. The following is an example of the section for an HP LaserJet III:

```
[HPPCL5A,LPT1]
FontSummary=D:\WIN\WIN30\SYSTEM\FSLPT1.PCL
paper=1
orient=2
prtresfac=2
duplex=0
prtcaps=-13440
paperind=0
```

After displaying the printer setup dialog box, WPRINT posts a message saying things have been changed (as discussed above). If you have *Word for Windows* running and you change the page orientation of the printer, you will notice that either its icon starts blinking or its title bar starts blinking. Then, when *Word* gets the focus again, you get an error stating that the orientation setup of the printer has been changed. It received notice of this change by way of the WM_WININICHANGE message.

WPRINT is a very simple utility that can make a tedious task into a simple drag-and-drop task. Instead of "File Open...Print...File Open...Print...File Open...," you simply select a file or files from the File Manager, click and drag with the mouse, and you're done! ■

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As with all good software, the programs presented in *PC Magazine* are upgraded and improved. You can get the modified versions by downloading them from PC MagNet. Here's a partial list of the programs that have been upgraded to fix minor bugs and system incompatibilities. If the filename listed here is longer than six letters, search on the first six letters, using the same extension.

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BCOPY, Version 1.2
Benchmark Series, Version 6.0a (BEN60A.EXE)
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by
Charles Petzold

# Environments

## Playing a MIDI Synthesizer from Your PC Keyboard

■ Explore how Multimedia Windows implements MIDI support with KBMIDI, a program that lets you play a MIDI synthesizer from your PC keyboard with complete control over the MIDI device, the channel, and the instrument voice.

The idea of using the PC keyboard for playing music is not new. Indeed, *PC Magazine*'s technical editor, Neil Rubenking, wrote a shareware program some years ago called PIANOMAN, which lets you play the PC speaker from the keyboard. Now I'll describe a program written for Microsoft Windows with Multimedia Extensions. Called KBMIDI, this program lets you use your PC keyboard to play an electronic music synthesizer.

As I've discussed in previous columns, the minimum-standard Multimedia PC requires an internal synthesizer that conforms to the MIDI (Musical Instrument Digital Interface) specification. Optionally, you can also connect an external synthesizer to the MIDI Out port, which is also required in the Multimedia PC.

KBMIDI gives you complete control over the MIDI output device (that is, the internal or external synthesizer), the MIDI channel, and the instrument voice. Besides being fun, I've found the program very useful for exploring how Multimedia Windows implements MIDI support.

The source code is too long to run in this column, but you can download it and KBMIDI.EXE from PC MagNet. Beginning with this program, I've included Make files for compiling under Borland C++ 3.0 (which I've just installed) and Microsoft C 7.0 (expected to be released by the time you read this).

Another change I've implemented is that all source code is C++ compatible. Although I'm not using any C++ features (yet!), the Make files include compiler switches for C++ mode. Because C++ sometimes does unusual things (like altering the names of public functions) and implements different types of error checking, making source code C++ compatible early on allows C++ features to be added more easily later.

### USING THE KBMIDI PROGRAM

I'm afraid that KBMIDI is not perfect or foolproof, so a few words about how to use it may save you some confusion.

When you run KBMIDI, it first appears as shown in Figure 1. The diagram in the center shows how the keys on the keyboard correspond to the keys on a traditional piano or organ. The Z key at the lower-left corner plays an A at 110 Hz. Moving across the bottom row of the keyboard, you reach middle C at the right, with the sharps and flats on the row above. The top two rows continue the scale, from middle C to G#. Thus, the range is three octaves. Pressing the Ctrl key drops the entire range by one octave, and pressing Shift raises it by one octave, giving an effective range of five octaves.

If you start trying to play immediately, though, you won't hear anything. First you must select Open from the Status menu to open a MIDI output device. If the port is successfully opened, pressing a key will send a MIDI Note On message to the synthesizer. (I won't guarantee you'll actually hear anything yet, as I'll explain later!) Releasing the key generates a Note Off message. Depending on the rollover characteristics of your keyboard, you can play multiple notes at once.

Select Close from the Status menu to close the MIDI device. This is handy if you want to run some other MIDI software under Multimedia Windows without terminating the KBMIDI program.

The Device menu lists the installed MIDI output devices, as shown in Figure 2. On my machine, KBMIDI lists three MIDI output devices: Microsoft MIDI Mapper, Sound Blaster 1 MIDI Output Port, and Ad Lib Synthesizer. The device names are obtained from midiOutGetDevCaps, and they are the same names displayed by the MIDIDEVS program I discussed in the March 31, 1992, column. The Ad Lib Synthesizer device is the synthesizer on the Sound Blaster board, which is Ad Lib compatible. The Sound Blaster 1 MIDI Output Port device is the MIDI Out port on a MIDI adapter box connected to the Sound Blaster board. This may or may not be connected to the MIDI In port of an external synthesizer.

The Microsoft MIDI Mapper device refers to one of the two real MIDI devices that the user selects in the MIDI Mapper utility invoked from the Control Panel. As I've discussed in previous columns, the MIDI Mapper provides some degree of device-independent programming by putting MIDI messages through maps that may alter the MIDI channels or instrument voice numbers.

By default, KBMIDI selects the first device in the menu. This is normally the MIDI Mapper device, but it's possible that the MIDI Mapper driver is not installed. Right now, I'll assume that the

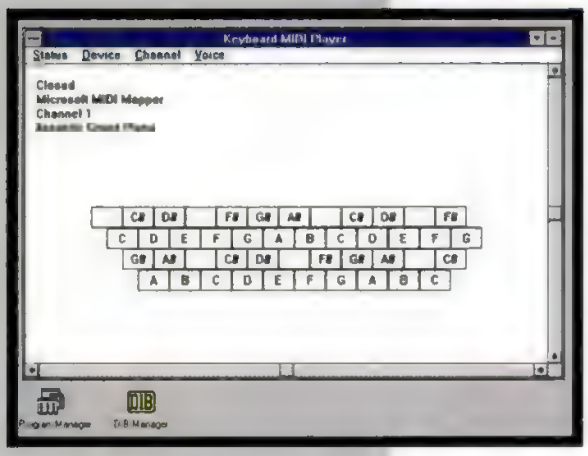


**Figure 1:** This is the KBMIDI program's initial display.

MIDI Mapper driver is installed and that you have correctly used the MIDI Mapper utility to select either the internal synthesizer or an external synthesizer.

The device selected in the MIDI Mapper is either a base-level synthesizer capable of three simultaneous melodic voices and a percussion voice, or an extended synthesizer capable of nine simultaneous melodic voices and a percussion voice. As I've discussed before, Microsoft has designated MIDI channels 1 through 9 for the nine melodic voices of an extended synthesizer and channel 10 for the percussion voice. For a base-level synthesizer, channels 13 through 15 are for the three melodic voices with channel 16 for the percussion voice. This configuration allows programs to use the MIDI channels in a reasonably device-independent manner for either type of synthesizer.

Normally, the setup maps in the MIDI Mapper utility enforce this configuration by blocking channels that the synthesizer shouldn't respond to. (I say "normally" because you can use the MIDI Mapper to do almost anything you want.)

The Channel menu lets you select a MIDI channel from 1 through 16. By default, channel 1 is selected. All MIDI messages that KBMIDI generates are sent on the selected channel.

Here's the most important rule for getting KBMIDI to work: If the synthesizer selected in the MIDI Mapper is a base-level synthesizer, you must use the Channel menu to select channel 13, 14, or 15. If it's an extended synthesizer, select channels 1 through 9. Once you've selected a correct channel, you should be able to play the keyboard and hear sounds.

### MELODIC VOICES AND PERCUSSION

The final menu on KBMIDI is labeled Voice, as shown in Figure 3. This is a double-nested menu from which you can select one of the 128 instrument voices defined by the General MIDI Mode specification and implemented in Multimedia Windows. The 128 instrument voices are divided into 16 instrument families with 8 instruments each, and are called the melodic voices because different MIDI key numbers correspond to different pitches.

There's also a wide range of nonmelodic percussion instruments available. To play them, use the Channel menu to select channel 16 for a base-level synthesizer or channel 10 for an extended synthesizer. Also select the first instrument voice (Acoustic Grand Piano) from the Voice menu. After you do this, each key plays a different percussion sound. There are 47 different percussion sounds, from MIDI key number 35 (the B two octaves below middle C) to 81 (the A nearly two octaves above middle C). I'll discuss the percussion channel in more detail in the next column.

The KBMIDI program has horizontal and vertical scroll bars. Because a PC keyboard is not velocity-sensitive, the horizontal scroll bar controls the note velocity. Generally, this corresponds to the volume of the notes that you play. When you set the horizontal scroll bar, all Note On messages will use that velocity.

The vertical scroll bar generates a MIDI message known as *pitch bend*. To use this feature, press down one or more keys and manipulate the vertical scroll bar thumb with the mouse. As you raise the scroll bar, the frequency of the note increases, and as you lower it, the frequency decreases. Releasing the scroll bar returns the pitch to normal.

As you manipulate a scroll bar, keyboard messages do not come through the program's message loop. Therefore, if you press a key and begin manipulating one of the scroll bars with the mouse, and then release the key before finishing with the scroll bar, the note will continue to sound. So you shouldn't press or release any keys while manipulating the scroll bars. A similar rule applies to the menu: Don't try to select anything from the menu while a key is depressed. And don't change the octave shift using the Ctrl or Shift keys between the time you press a key and release it.

If one or more notes get "stuck" and continue to sound after being released, press the Esc key. This sends 16 "All Notes Off" messages to the 16 channels of the MIDI synthesizer.

### SWITCHING WITH THE MIDI MAPPER

By default, the KBMIDI program selects the MIDI Mapper on the Device menu if the MIDI Mapper driver is installed. If you've never invoked the MIDI Mapper utility from the Control Panel, the opening screen shows that the internal synthesizer in your Multimedia PC is the selected device.

If you have an external synthesizer connected to the MIDI Out port of your Multimedia PC, and if you have setup, patch, and key maps for this synthesizer, you can use the MIDI Mapper to switch to the external synthesizer. Be sure to

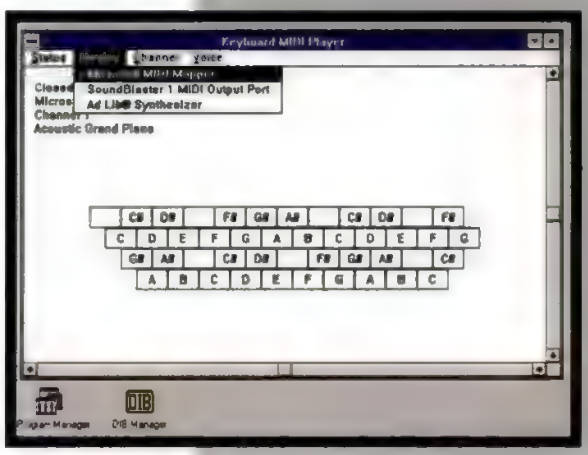


**Figure 2:** The Device menu shows the installed MIDI output devices.

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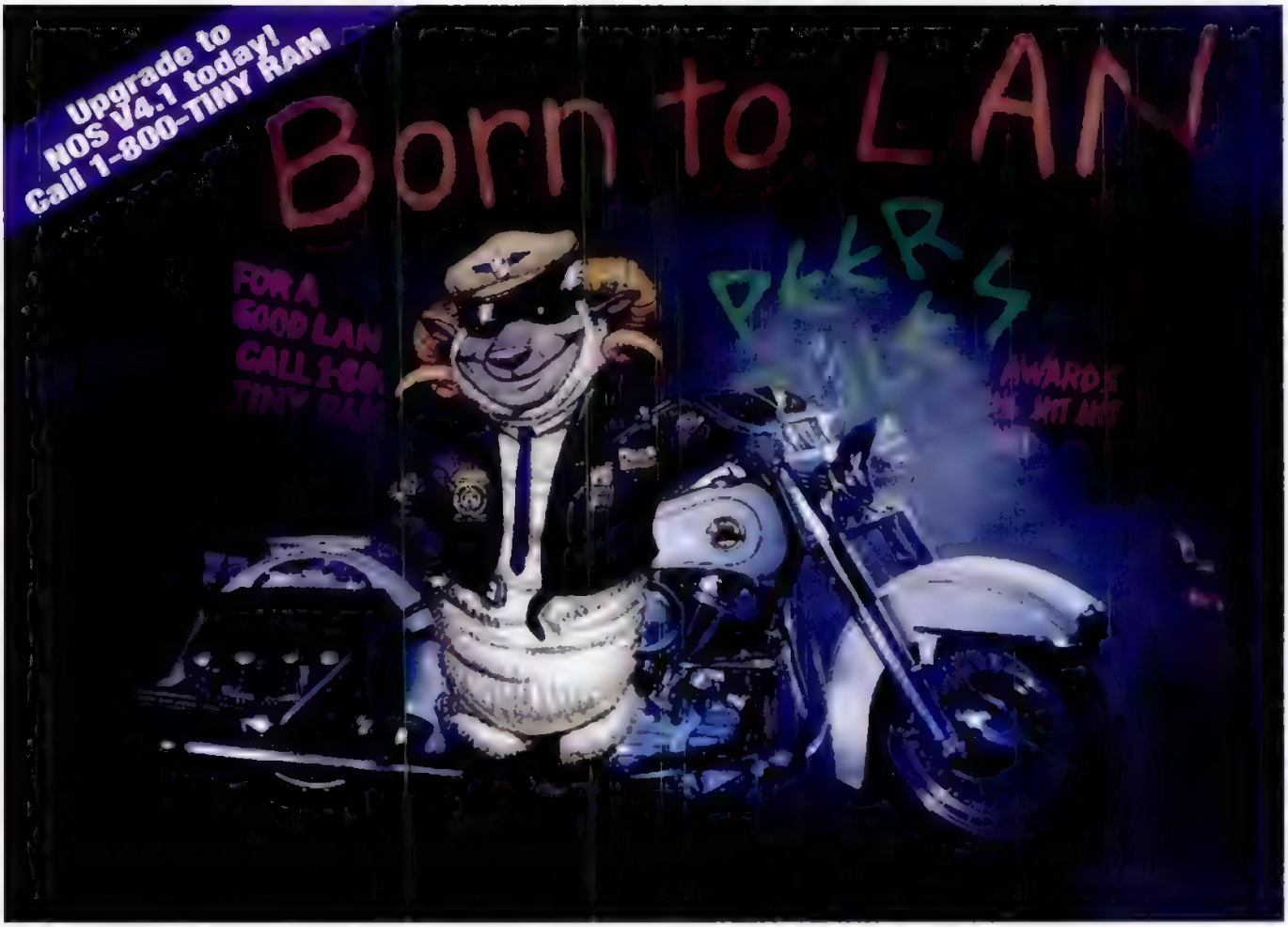


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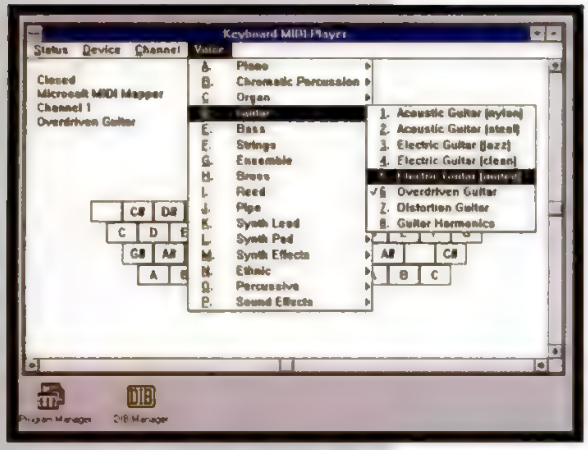



**Figure 3:** The Voice menu lists the 128 standard instrument voices.

select Close from KBMIDI's Status menu before attempting to use the MIDI Mapper utility. You can then open the MIDI Mapper device in KBMIDI and play music on the external synthesizer.

### USING THE REAL MIDI DEVICES

You can also select one of the real MIDI devices from the Device menu. If you do, though, all MIDI messages that KBMIDI generates are sent directly to the synthesizer without passing through the maps defined in the MIDI Mapper utility, and you'll have no real guarantees that the instrument voice you select from the Voice menu will still produce the desired sound.

Most internal synthesizers will be set up by their device drivers to conform to the General MIDI Mode specification. For example, when I select Ad Lib Synthesizer (a base-level synthesizer) from the Device menu, the Voice menu continues to function normally. In addition, the synthesizer responds to all channels rather than just 13 through 16. Channel 16 is still the percussion channel.

I have a Roland SC-55 Sound Canvas connected to the MIDI Out port of my Sound Blaster board. This is considered an extended synthesizer, and it conforms to the General MIDI Mode voice mappings, so if I select the "Sound Blaster 1 MIDI Output Port" device, the Voice menu is also still valid. In addition, the synthesizer responds to messages on channels 11 through 16, which are blocked by the MIDI Mapper.

I can switch the SC-55 into a mode where it emulates the voice mappings of the Roland MT-32. If I do this and select the Sound Blaster 1 MIDI Output Port device, the Voice menu is no longer accurate. The MIDI Program Change messages that KBMIDI sends to the synthesizer instead select the MT-32's instrument voices.

If the SC-55 is in the MT-32 emulation mode and I select the Microsoft MIDI Mapper from the Device menu, the Voice menu is still inaccurate because the MIDI Mapper still thinks I have the SC-55 on the output port. But if I go into the MIDI Mapper utility and switch to the setup map for an MT-32 connected to the Sound Blaster board, the Voice menu in KBMIDI becomes accurate now that the MIDI Program Change messages are being altered to conform to the MT-32.

### A DEVICE-INDEPENDENT KBMIDI?

I wrote KBMIDI to allow me—and you—to select the MIDI device and the channel so we could experiment in the ways mentioned above. But, as you'll discover, the result sometimes is that you won't hear anything from the program, or the Voice menu is inaccurate.

Assuming that you've correctly used the MIDI Mapper utility in the Control Panel, only by selecting the MIDI Mapper device in KBMIDI are you guaranteed that the Voice menu is accurate. But you still need to know whether you're dealing with a base-level or an extended synthesizer so you can select the correct MIDI channel.

How could KBMIDI be altered to be device-independent? Very simply, it wouldn't have either a Device menu or a Channel menu. KBMIDI would always open the MIDI Mapper device, and send all MIDI messages both on channels 1 for an extended synthesizer and 13 for a base-level synthesizer.

I know I've said this a lot, but only because it's very important: For device-independent MIDI programming, open the MIDI Mapper device and duplicate MIDI messages on the channels associated with base-level and extended synthesizers.

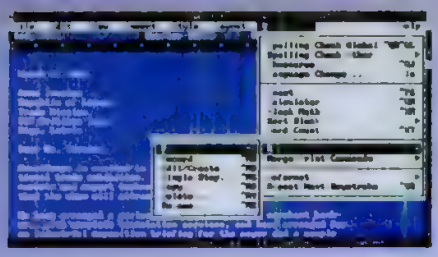
### KBMIDI: THE INNER WORKINGS

I've documented KBMIDI.C more than usual so you can download it from PC MagNet and figure it out without too much

**ROUTINES FOR SIMPLIFYING MIDI OUTPUT**

```
          // Routines for simplifying MIDI output
          // ------------------------------------

DWORD MidiOutMessage (HMIDIOUT hMidi, int iStatus, int iChannel,
                                      int iData1,  int iData2)
     {
     DWORD dwMessage ;

     dwMessage = iStatus | iChannel | (iData1 << 8) | ((long) iData2 << 16) ;

     return midiOutShortMsg (hMidi, dwMessage) ;
     }

DWORD MidiNoteOff (HMIDIOUT hMidi, int iChannel, int iOct, int iNote, int iVel)
     {
     return MidiOutMessage (hMidi, 0x080, iChannel, 12 * iOct + iNote, iVel) ;
     }

DWORD MidiNoteOn (HMIDIOUT hMidi, int iChannel, int iOct, int iNote, int iVel)
     {
     return MidiOutMessage (hMidi, 0x090, iChannel, 12 * iOct + iNote, iVel) ;
     }

DWORD MidiSetPatch (HMIDIOUT hMidi, int iChannel, int iVoice)
     {
     return MidiOutMessage (hMidi, 0x0C0, iChannel, iVoice, 0) ;
     }

DWORD MidiPitchBend (HMIDIOUT hMidi, int iChannel, int iBend)
     {
     return MidiOutMessage (hMidi, 0x0E0, iChannel, iBend & 0x7F, iBend >> 7) ;
     }
```

**Figure 4:** These functions in KBMIDI are used to simplify the sending of MIDI messages.



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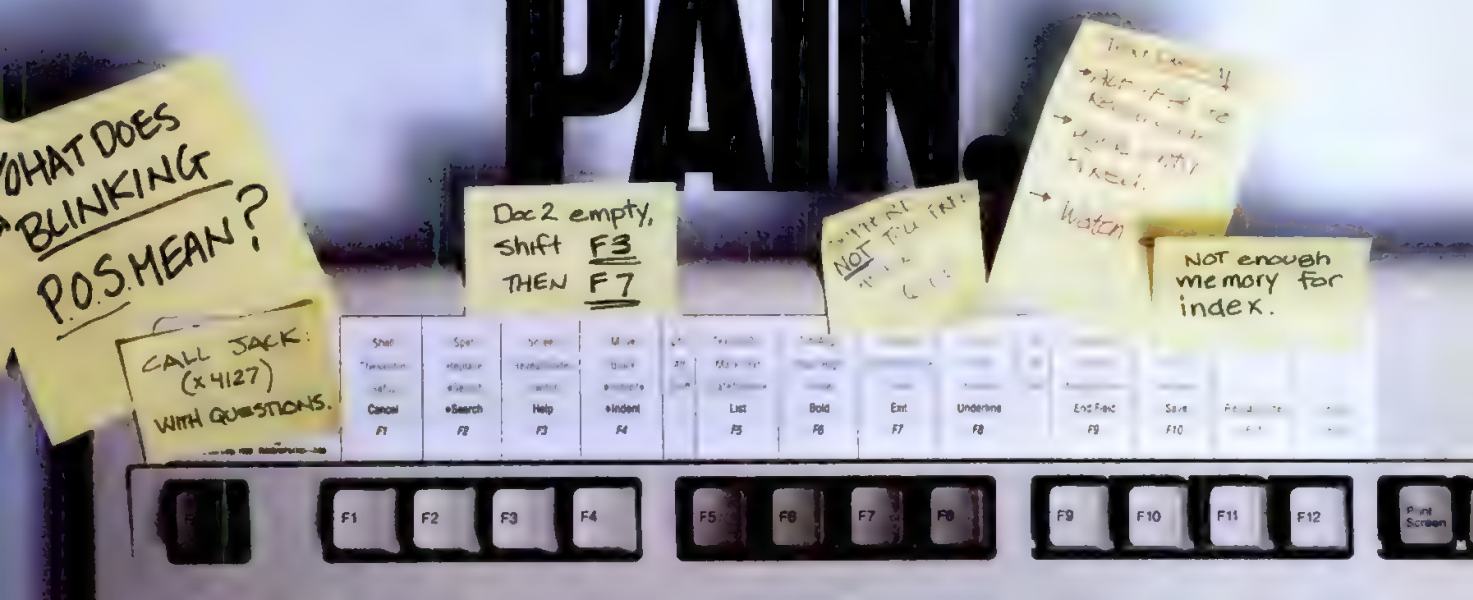

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difficulty. What I'll describe here is basically an overview.

KBMIDI doesn't have a resource script; instead it creates its own menu from scratch. The device names are obtained from the midiOutGetDevCaps function, and the instrument voice families and names are stored in a large data structure.

KBMIDI has a few short functions for simplifying the MIDI messages, as shown in Figure 4. I've discussed these messages in previous columns, except for pitch bend. This message uses two 7-bit data bytes that comprise a 14-bit pitch-bend level. Values between 0 and 0x1FFF lower the pitch and values between 0x2001 and 0x3FFF raise it.

When you select Open from the Status menu, KBMIDI calls midiOutOpen for the selected device and (if successful) calls the MidiSetPatch function shown in Figure 4. When changing a device, KBMIDI must close the previous device if necessary, and then reopen the new device. The program must also call MidiSetPatch when you change the MIDI device, the MIDI channel, or the instrument voice.

KBMIDI processes WM_KEYUP and WM_KEYDOWN messages to turn notes on and off. A data structure within KBMIDI maps keyboard scan codes to octaves and notes. For example, the Z key has a scan code of 44, and the structure identifies this as octave 3 and note 9—an A. In the MidiNoteOn function in Figure 4, these are combined to form a MIDI key number of 45 (12 times 3 plus 9). This same data structure is used for drawing the keys on the window; each key has a particular horizontal and vertical position and a text string shown inside the rectangle.

Horizontal-scroll-bar processing is straightforward; the only things that need to be done are to store the new velocity level and set the new scroll bar position. Vertical-scroll-bar processing to control pitch bend is a little unusual. The only scroll bar commands it processes are SB_THUMBTRACK (which occurs when you manipulate the scroll bar thumb with the mouse) and SB_THUMBPOSITION (when you release the thumb). On an SB_THUMBPOSITION command, KBMIDI sets the scroll bar position to its middle level and calls MidiPitchBend with a value of 8192.

**NEXT ISSUE: A DRUM MACHINE**

Some percussion instruments (such as a xylophone or timpani) are termed *melodic* or *chromatic* because they can play tones in different pitches. A xylophone has wooden blocks corresponding to different pitches, and timpani can be tuned. These two instruments, as well as several other melodic percussion instruments, can be selected from the Voice menu in KBMIDI. However, many other percussion instruments are nonmelodic. They cannot be tuned and usually contain too much noise to be associated with a particular pitch.

These nonmelodic percussion voices are available through channels 10 for an extended synthesizer and 16 for a base-level synthesizer. In this case, different key numbers correspond to 47 different percussion instruments defined by the General MIDI Mode specification and Multimedia Windows.

If you have fun playing these percussion instruments from KBMIDI, you should definitely take a look at next issue's column. I'll describe a MIDI drum machine program that lets you interactively program a sequence of percussion sounds for automated playback. ■


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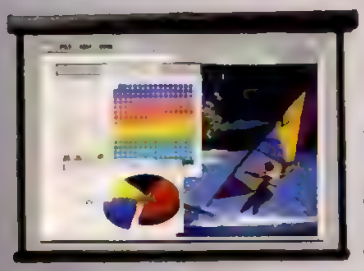

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CIRCLE 193 ON READER SERVICE CARD

by
Ray Duncan

# Power Programming

## Processing Written Input in a Pen-Centric Application

Acquiring handwritten input, translating that input into characters and commands, and delivering the results to an application program is a complex process requiring the cooperation of many different Pen Windows modules. First, the pen input device driver tracks the motion of the stylus, calls the display driver to put "ink" on the screen, and stores the stylus strokes as a series of *x,y* coordinates.

Next, the recognizer module partitions the collection of strokes into chunks called *glyphs*, matches the glyphs against its internal prototypes for characters and gestures, and encodes all the possible translations of the input as a structure called a *symbol graph*. Then the RC (Recognition Context) Manager packages the symbol graph with other information about the input, and optionally passes the symbol graph to an application-specified dictionary module that helps it choose the most likely translation. Finally, the RC Manager ships the results to the application, in a form that depends on the type of application as well as its mode of input.

A pen-oblivious application, designed for vanilla Windows and knowing nothing about pens, receives the translated input as a series of ordinary character (WM_CHAR) and mouse messages, through the mediation of the PenPal utility. A pen-aware application, which adjusts its operation for the presence or absence of Pen Windows, typically performs most of its input using dialog boxes with HEDIT or BEDIT controls and obtains the translated strings or characters via the usual dialog control-oriented functions and windows messages.

A pen-centric application, which is completely designed for (and dependent on) a pen-oriented environment, creates explicit areas on-screen for handwritten input and makes use of specialized Pen Windows functions such as Recognize() or ProcessWriting() to obtain information from the user. A pen-centric application can exert control over the handwritten input process at every level from ink to character strings (Figure 1).

■ A sophisticated Pen Windows application might want to access symbol graph data and evaluate translation possibilities for itself. Here's a sample program that lets you get a head start.

As we saw in the last few installments of this column, two data structures are key to the proper operation of a pen-centric application: the RC data structure and the RCRESULT structure. The RC data structure, which was described in detail in the March 17, 1992, column, is used by the application to pass information and guidance to the RC Manager, recognizer, and pen driver. It contains the handle of the window that should receive the input results, character set specifiers, addresses of dictionary entry points, a bounding rectangle for the written input, a time-out threshold, and similar parameters. The RCRESULT structure, on the other hand, is used by the RC Manager to pass results back to the application. It provides a huge amount of information, either directly or in the form of pointers to related data structures. A thorough understanding of RCRESULT is crucial to your success as a Pen Windows programmer.

### RCRESULT AND ITS RELATIVES

Let's review how a pen-centric application that uses Recognize() gets its hands on an RCRESULT structure in the first place, before examining the structure in more detail. The program must first allocate and initialize an RC data structure within its own address space. When an event occurs that indicates the user wants to start writing, usually a "pen-down" condition within the designated writing area, the application calls Recognize(), passing the address of the RC structure. When the user signals that input is complete—by allowing a time-out period to elapse, tapping the pen outside the writing input area, or some other method—the RC Manager allocates memory to hold the results and sends a WM_RCRESULT message to the callback routine that was specified in the RC data structure. The lParam portion of the WM_RCRESULT message contains a far pointer to the RCRESULT structure.

After the application's callback routine processes (or ignores) the WM_RCRESULT message and returns, the RC Manager deallocates the memory holding the input results and returns to the application from the Recognize() call. The "value" of the Recognize() function is a status code that indicates how the input was terminated or whether an error occurred. Note carefully that the address of the RCRESULT structure and its relatives is only valid while the callback routine is in control during the WM_RCRESULT message; if the application wants to access any part of the RCRESULT data at some later time, it must allocate memory

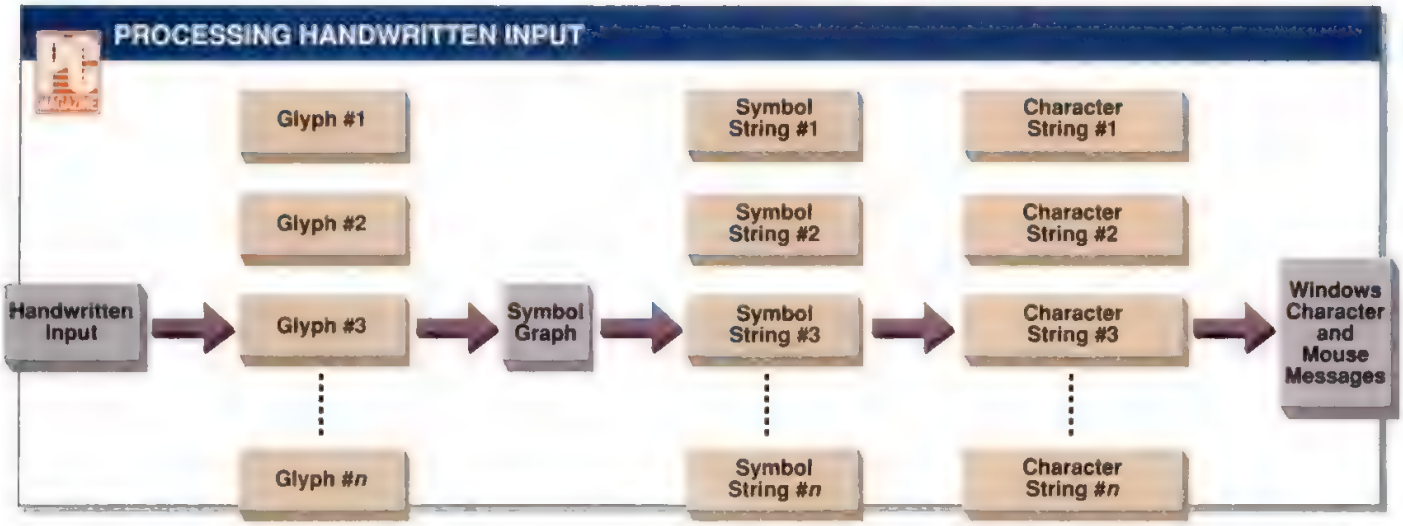


**Figure 1:** The handling and translation stages of written input under Pen Windows.

within its own address space and copy the data there before returning from the callback routine.

The operation of the ProcessWriting() function is quite similar to Recognize(), except that the application is not obligated to supply an RC structure to ProcessWriting(), and if the application ignores the WM_RCRESULT message, the RC Manager will automatically convert the input into character (WM_CHAR) messages and send them to the application as though they had been entered at the keyboard.

Although I provided you with an overview of the RCRESULT data structure and a demonstration program (DEMO6.EXE) that processes WM_RCRESULT messages in the April 14, 1992, column, the truth is that we only scratched the surface of this interesting structure. The elements that we are most interested in for the purposes of applications programming are the result type (rcresult.wResultsType), the pointer to the "best bet" symbol string (rcresult.lpsyv), the symbol graph (rcresult.SYG), the handle to the pen data memory block (rcresult.hpendata), the point that terminated recognition (rcresult.pntEnd), and the pointer to the RC data structure passed in the original Recognize() or ProcessWriting() call (rcresult.lprc).

A relatively simple pen-centric application can get by most of the time with just the result type (rcresult.wResultsType) and "best bet" symbol string pointer (rcresult.lpsyv) elements of the RCRESULT data structure. The result type tells the application whether the input was text, a gesture, or something unrecognizable. The symbol string can be converted into a standard ASCIIZ string by passing rcresult.lpsyv to the Pen Windows function SymbolToCharacter().

A slightly more complex pen-centric application may want to actually "enumerate" and inspect all of the possible translations of the symbol graph without worrying about the symbol graph's internal representation, as our DEMO6 program did. It can do this by passing the address of the rcresult.SYG element to the Pen Windows function EnumSymbols(), along with the address of a callback routine. Pen Windows evaluates the symbol graph and passes each candidate symbol string to the callback function, which can convert it to an ASCIIZ string with the SymbolToCharacter() function.

A sophisticated pen-centric application might want to reach inside the symbol graph and evaluate the translation possibilities for itself without relying on the EnumSymbols() function. Accessing the symbol graph data turns out to be quite an easy task. The rcresult.SYG element of the RCRESULT data structure is actually a structure within a structure, and the most important members of the SYG structure are a far pointer to an array of *symbol elements* (SYEs) and a count of the SYEs in the array. Each symbol element is in turn another structure, whose most important components are a *symbol value* (SYV) and a *confidence level*. Other data found in the SYG includes a far pointer to an array of *symbol correspondence elements* (SYCs) and a count of the SYCs in the array. SYCs can be used by the application to relate a particular SYE to the

**SYMBOL VALUE ELEMENT CLASSES**

| HIGH-ORDER WORD | SYV CLASS |
|---|---|
| 0 | System symbols |
| 1 | ANSI character codes |
| 2 | Gestures |
| 3 | Kanji |
| 4 | Shapes |
| 5 | Unicode |
| 6 | Virtual keys |
| 7-7EFFh | Reserved |
| 7F00h-7FFFh | Recognizer-specific symbols |
| 8000h-FFFFh | Code page |

**Figure 2:** This table lists the ten symbol value element (SYV) classes. The high word of a 32-bit SYV indicates its class, and the interpretation of the low word depends on the class. For example, in the case of an ANSI SYV, the low word of the SYV contains an ANSI character value in bits 0 through 7, and bits 8 through 15 are zeroed.

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## SYSTEM SYMBOL ELEMENTS

| SYSTEM SYV VALUE | INTERPRETATION |
|---|---|
| SYV_BEGINOR | Begins a list of alternate translations of the same glyph |
| SYV_EMPTY | Empty |
| SYV_ENDOR | Ends a list of alternate translations of the same glyph |
| SYV_NULL | Null terminator |
| SYV_OR | Separator between alternate translations of the same glyph |
| SYV_SOFTNEWLINE | A "soft return" in handwritten input, typically interpreted as a space |
| SYV_UNKNOWN | Unrecognized glyph |

**Figure 3:** These are the special system symbol elements (SYVs with 0 in the high word) that can be passed to an application in a symbol graph.

original pen strokes from which it was translated.

The most complex pen-centric applications can use the pen data memory block handle (rcresult.hpendata) to gain access to more primitive pen input information. The first step is to pass the pen data handle and the address of a PENDATAHEADER structure to the Pen Windows function GetPenDataHeader(), which initializes the structure with information such as the number of bytes of pen input data, the number of pen strokes detected, and the characteristics of the input tablet. The application can then use the functions BeginEnumStrokes(), GetPenDataStroke(), and EndEnumStrokes() to retrieve the raw data associated with arbitrary, individual pen strokes.

GetPenDataStroke() returns information about a particular pen stroke in the form of a far pointer to a list of *x,y* points and a STROKEINFO structure that specifies the number of points in the stroke, the time of the stroke, and certain state information associated with the stroke.

Now let's return to consideration of symbol value (SYV) elements, which are the meat of the symbol graph (SYG). An SYV is a 32-bit value that can fall into one of ten classes according to the value of the most significant word of the SYV, as shown in Figure 2. The classes that we are most interested in from the point of view of normal applications programming are the system symbol values shown in Figure 3, the ANSI symbol values, and the gesture symbol values listed in Figure 4. The ANSI symbol values simply have the ANSI character code in the low byte, and alternative ANSI SYVs for the same glyph are framed by the system symbol values SYV_BEGINOR, SYV_OR, and SYV_ENDOR. For example, imagine that the user wrote the glyph *s*, and the recognizer couldn't quite decide whether the user meant *s*, *S*, or *5*. The glyph would then be represented in the symbol graph as a series of SYEs containing the following SYVs:

```
System SYV_BEGINOR
ANSI SYV for "s"
System SYV_OR
ANSI SYV for "S"
System SYV_OR
ANSI SYV for "5"
System SYV_ENDOR
```

By convention, we (along with the authors of the Pen Windows programming documentation) use the shorthand notation { s | S | 5 } for this particular sequence of SYEs.

The application can compare the confidence levels for the alternative ANSI SYVs to try to deduce which of the translations of the individual glyph is the most likely. However, it's only fair to point out that most applications probably won't root around in the symbol graph at all, and will rely on EnumSymbols() and dictionary modules to cough up the preferred

## GESTURE SYMBOL ELEMENTS

| GESTURE SYV VALUE | INTERPRETATION |
|---|---|
| 20000h-200FFh | Command gesture. The low byte contains the ANSI character code that was modified by the gesture. |
| SYV_BACKSPACE | Deletes character under the gesture. |
| SYV_CLEAR | Clears the current selection. |
| SYV_CLEARWORD | Deletes the word or object under the gesture. |
| SYV_COPY | Copies the current selection to the clipboard. |
| SYV_CORRECT | Corrects selection or word under the gesture. |
| SYV_CUT | Copies the current selection to the clipboard and then deletes it. |
| SYV_EXTENDSELECT | Extends a text selection from the current insertion point to the point of the gesture, or adds the object under the gesture to the current selection. |
| SYV_PASTE | Pastes the contents of the clipboard at the point of the gesture. |
| SYV_RETURN | Equivalent to pressing the Enter key. |
| SYV_SPACE | Equivalent to pressing the spacebar. |
| SYV_TAB | Equivalent to pressing the Tab key. |
| SYV_UNDO | Undoes previous action. |
| SYV_USER | Any circle gesture. |

**Figure 4:** These are the special gesture symbol elements (SYVs with the value 2 in the high word) that can be passed to an application in a symbol graph. It is important to realize that the interpretations listed in the right column describe what the pen-centric application is expected to do in response to a particular gesture. The Pen Windows system merely recognizes the gesture and translates it to a gesture value on behalf of the application; it doesn't take any type of action on the gesture itself.

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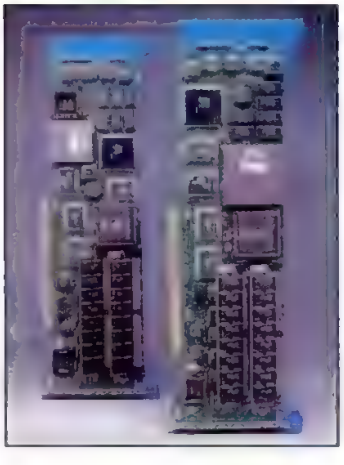

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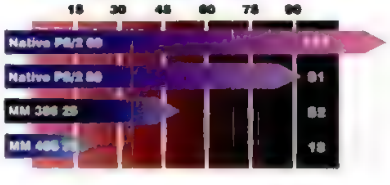


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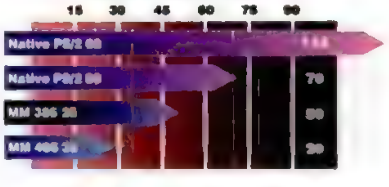


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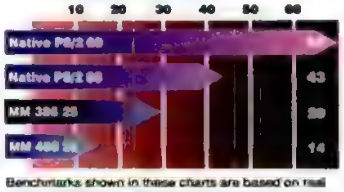


Benchmarks shown in these charts are based on real world applications, taking into account CPU, memory, disk, and video performance. Smaller numbers indicate higher performance.

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translation of a symbol graph rather than trying to figure it out directly.

**A PEN-CENTRIC EXAMPLE**

In order to give you a head start on exploring symbol graphs, I've written an example program called DEMO7.EXE. You can download all the source files for DEMO7.EXE, as well as the executable file, from the Programmer's Forum on PC MagNet.

DEMO7 is an elaboration of the DEMO6 program published in the last installment of this column, and it retains the same overall structure. From the user's perspective, DEMO7 looks just like DEMO6, too, except for the addition of an Options pop-up on the menu bar. DEMO7's frame window is divided into two child windows: a writing input window on the left and a text output window on the right. The Options menu allows the user to specify whether the program will display the contents of the RCRESULT structure, enumerate the candidate symbol strings, or decode the symbol graph in the text output window. Figure 5 illustrates DEMO7 in action. I've written the word *Test* in the left window, and the program has dumped the contents of the resulting symbol graph into the right window.

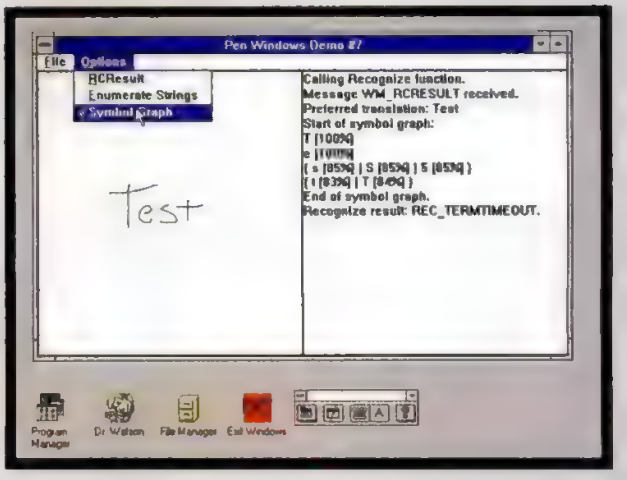


**Figure 5:** The DEMO7 program running under Pen Windows, with the symbol graph display option selected. I have written the word *Test* in the left window; the symbol graph returned by the Recognize() function is displayed in the right window.

Much of the source code for DEMO7 is symmetric with the code in the last issue's example program, DEMO6. For an explanation of the WinMain(), InitApplication(), InitInstance(), FrameWndProc(), TextWndProc(), WriteWndProc(), DoCommand(), and EnumFunc() functions, refer to the previous column. Most of the new code is in the ShowRCResult(), ShowSymbolString(), and ShowSymbol-Graph() functions, which correspond to the three choices on the Options pop-up menu.

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**SHOWSYMBOLGRAPH()**

```
// ShowSymbolGraph -- displays contents of symbol graph
//
void ShowSymbolGraph(LPRCRESULT rcresult)
{
    LPSYE lpSye = rcresult->syg.lpSye;          // first symbol element
    int cSye = rcresult->syg.cSye;              // no. of symbol elements
    int Level = 0;                              // SYV_BEGINOR nesting level
    SYV syv;                                    // current symbol value
    char syvChar;                               // current character
    int syvCl;                                  // current confidence level
    int syvType;                                // current symbol type
    char buff1[BUFMAX], buff2[BUFMAX];          // scratch buffers
    int i, j;                                   // scratch variable
    char * p;                                   // scratch pointer

    SymbolToCharacter(rcresult->lpSyv, BUFMAX, buff2, NULL);
    wsprintf(buff1, "Preferred translation: %s", (LPSTR) buff2);
    DisplayLine(buff1);                         // best bet translated string

    DisplayLine("Start of symbol graph:");  // now dump the symbol graph

    for(i = 0; i < cSye; i++)
    {
        syv = lpSye[i].syv;                     // get current symbol value
        syvType = HIWORD(syv);                  // extract symbol type
        syvChar = ChSyvToAnsi(syv);             // extract character if any
        syvCl = lpSye[i].cl;                    // get confidence level

        switch(syvType)                         // format according to type
        {
            case(SYVHI_SPECIAL):                // SYV system values
                if(syv == SYV_BEGINOR)          // start of char. choice list
                {
                    if(Level)                   // if stuff already waiting
                        DisplayLine(buff1); // in buffer, display it
                    p = buff1 + wsprintf(buff1, "{ ");
                    Level++;                    // count nesting levels
                }
                else if(syv == SYV_OR)          // choice list separator
                {
                    p += wsprintf(p, " | ");
                }
                else if(syv == SYV_ENDOR)       // end of char. choice list
                {
                    wsprintf(p, " }");
                    DisplayLine(buff1);         // display choice list
                    p = buff1;
                    Level--;                    // count nesting levels
                }
                else                            // decode & display all
                {                               // other system SYV values
                    for(j = 0; j < dim(syvSystemValue); j++)
                    {
                        if(syvSystemValue[j].Code == syv)
                            DisplayLine(syvSystemValue[j].Name);
                    }
                }
                break;

            case(SYVHI_ANSI):                   // SYV ASCII characters
                if(syv == SYV_SPACENULL)        // format char. & conf. level
                    wsprintf(buff2, "NO SPACE [%d%%]", syvCl);
                else if(syvChar == ' ')
                    wsprintf(buff2, "SPACE [%d%%]", syvCl);
                else if(syvChar < ' ')
                    wsprintf(buff2, "%02Xh [%d%%]", syvChar, syvCl);
                else
                    wsprintf(buff2, "%c [%d%%]", syvChar, syvCl);

                if(Level)                       // within char. choice list?
                    p += wsprintf(p, "%s", (LPSTR) buff2);  // yes, append
                else                            // no, display text now
                    DisplayLine(buff2);
                break;

            case(SYVHI_GESTURE):                // SYV gestures
                for(j = 0; j < dim(syvGestureValue); j++)
                {                               // decode gesture value
                    if(syvGestureValue[j].Code == syv)
                    {                           // found match, display it
                        DisplayLine(syvGestureValue[j].Name);
                        break;
                    }
                    if(j == dim(syvGestureValue))
                    {                           // no match, show hex value
                        wsprintf(buff1, "gesture: %08lXh", syv);
                        DisplayLine(buff1);
                    }
                }
                break;

            case(SYVHI_KANJI):                  // Kanji
            case(SYVHI_SHAPE):                  // shapes
            case(SYVHI_UNICODE):                // Unicode
            case(SYVHI_VKEY):                   // virtual keys
            default:                            // whatever else
                wsprintf(buff1, "type %d: %08lXh", syvType, syv);
                DisplayLine(buff1);
        }
    }
    DisplayLine("End of symbol graph.");
}
```

**Figure 6:** The ShowSymbolGraph function displays the contents of the symbol graph.

The ShowRCResult() function is little more than a brute-force formatting and display of the various fields of the RCRESULT data structure, using wsprintf() and DisplayLine(). ShowSymbolStrings() is very simple, because the PenWindows function EnumSymbols() and the DEMO7 callback function EnumFunc() do all the heavy labor of enumerating the symbol strings in order of preference, translating the symbol strings to character strings, and displaying the character strings in the text output window.

That leaves us with the function ShowSymbolGraph(), shown in Figure 6, as the center of attention. ShowSymbolGraph() first extracts some information from the symbol graph structure (SYG) embedded in the RCRESULT structure, namely the pointer to the array of symbol elements (SYEs) from the field rcresult.syg.lpsye and the number of symbol elements from the field rcresult.syg.cSye. ShowSymbolGraph() then loops across the SYE array to process the SYEs in order. After extracting the SYV value, the SYV type (from the high word of the SYV), and the character value and confidence level from the SYE (if any), the routine falls into a switch statement based on the SYV type.

If the SYV happens to be a system value, the SYV_BEGINOR, SYV_OR, and SYV_ENDOR values are tested for and given special treatment because they influence the formatting of ANSI character output; other system SYV values are decoded using the table syvSystemValue[ ] and their names are displayed. ANSI SYVs are displayed along with their confidence values, framed by curly braces and "or" symbols when they are alternative translations for a single glyph. Gesture SYVs are decoded using the table syvGestureValue[ ] and their names are displayed. All other types of SYVs are displayed as their 32-bit hex values.

The DEMO7 program is meant only as an exploratory tool and test-bed and lacks a great deal in terms of polish and convenience. If nothing else, hundred-line functions such as ShowRCResult() and ShowSymbolGraph() are hardly good examples of a compact, clean, modular programming style!

If you're feeling energetic and brave, you might want to improve DEMO7 with some new capabilities. One obvious enhancement would be to copy the RCRESULT and SYE information to local storage during processing of the WM_RCRESULT message, so that the user could get alternative views of the same input after the fact. (In the version of DEMO7 printed here, the user must decide which view he wants before writing in the input window.) Another desirable change would be to display the symbol graph as a true graph, with boxes and arrows that illustrate the alternative translations.

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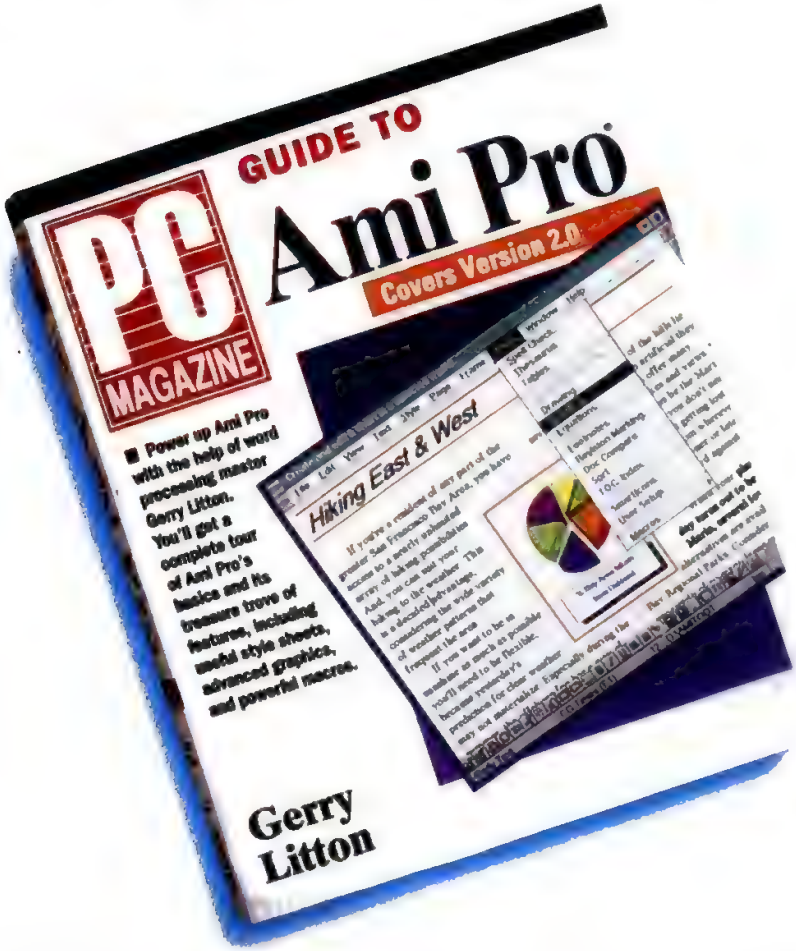


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by
Sal Ricciardi

# Databases

## JULIAN DAYS

In *Clipper*, a date can be converted to its Julian number (used in astronomy and certain other sciences) with the following function:

```
* Clipper Julian day function
FUNCTION julian
PARAMETERS pdate
RETURN pdate - CTOD("")
```

To use the function, you pass it a date variable and it returns a numeric variable containing the Julian number. To the best of my knowledge, this use of CTOD() to obtain the Julian number is not documented.

Robert A. Kelly
Florham Park, New Jersey

According to the *Academic American Encyclopedia* (on-line edition, Grolier Electronic Publishing, Danbury, Conn., 1991) "The Julian day is the unit of a chronological system, created by Joseph Scaliger in 1582, in which any date is measured by counting the number of days from an arbitrary zero day, Jan. 1, 4713 BC, at noon, Greenwich time. It is now used mostly in astronomy to calculate the number of days between two widely separated periodic events, such as eclipses. The Julian date (JD) of Jan. 1, 1980 (at noon), is JD 2,444,240.0."

In modern computer usage, the terms *Julian day* (JD), *Julian date*, *Julian number*, and *Julian period number* are often used to refer to either the number of days from the origin of the Julian calendar or the number of days from some base date, often the first of the year.

To calculate the former, Mr. Kelly's discovery works well using either *Clipper* 5.0 or *Clipper* S87 and does indeed seem to be undocumented. Apparently, at least in the context of this calculation, *Clipper* considers an empty date (the result of CTOD("")) to be equivalent to the base date in the Julian calendar. As a result, when you execute

- JULIAN DAYS: *Clipper* and *dBASE* functions that calculate Julian days.
- THE HOME/END KEYS IN PARADOX: Fix *Paradox*'s Home and End keys by putting these commands in your Init script.
- DEBUGGING USING ON KEY LABEL: Endless loops don't have to be. Here's why.

```
? CTOD("1/1/80") - CTOD("")
```

in *Clipper* the result is 2,444,240, which is the JD for January 1, 1980, as mentioned before. You'll find that this works for dates in the range 1/1/0100 to 12/31/2999, since that's the date range *Clipper* supports. While this works well in *Clipper*, it doesn't work in *dBASE IV* or *FoxPro*. Luckily, *FoxPro* includes two functions, SYS(1) and SYS(11), that return the Julian day for the current date and a specified date, respectively. For example, in *FoxPro*

```
? SYS(11, {1/1/80} )
```

returns 2,444,240 as expected.

For *dBASE IV* you'll need something a little different. Since *dBASE* supports dates beginning with 01/01/0100, you can note the JD for that day and use it as a constant in the Julian day calculation. The Julian day function is then a simple matter of using *dBASE*'s built-in ability to calculate the number of days that have elapsed since 01/01/0100, followed by adding in the JD constant. Since the JD for 01/01/0100 is 1,757,585, the function becomes

```
* dBASE IV
FUNCTION jd
PARAMETERS pdate
RETURN (pdate - {1/1/0100})
   + 1757585
```

For example, to get the JD for Jan. 1, 1980:

```
. d = {1/1/1980}
. ? jd( d )
  2444240
```

To calculate a relative Julian day number that represents the number of days elapsed since the start of the year, you can use the following function:

```
FUNCTION rjd
PARAMETER d
boy = CTOD("01/01/" +
  LTRIM(STR(YEAR( d ))))
RETURN (d - boy) + 1
```

where `boy` is the beginning of the year. Calling the `rjd` function for 12/31/91 yields 365. The `rjd` function works in *Clipper*, *FoxPro*, and *dBASE IV*.

## THE HOME/END KEYS IN PARADOX

The designers of Borland's *Paradox* made an error, in my opinion, when they decided how the Home and End keys should be used. In *Paradox*, with a table listed on-screen, pressing the Home key moves the cursor to the first record at the top of the column, while pressing Ctrl-Home moves the cursor left to the record number at the beginning of the row. The End key moves the cursor down to the last record, while Ctrl-End moves the cursor right, to the end of the row.

In every other word processor, spreadsheet, and database package I have come across, the Home and Ctrl-Home keys operate the other way around. And the same is true of the End and Ctrl-End keys. The situation can be rectified by including the lines shown in Figure 1 in your Init script, which will automatically be played

HOMEND.SC COMPLETE LISTING

```
; HOMEND.SC  Fix the Home, End, Ctrl-Home and Ctrl-End keys so
; they respond the way you'd expect them to.  Place these in your
; Init.sc file.

; <Home>
SetKey -71 If IsFieldView() Then Home Else CtrlHome EndIf

; <End>
SetKey -79 If IsFieldView() Then End Else CtrlEnd EndIf

; <Ctrl+Home>
SetKey -119 Home

; <Ctrl+End>
SetKey -117 End
```

**Figure 1:** This *Paradox* script changes the behavior of the Home, Ctrl-Home, End, and Ctrl-End keys to conform to what most people expect of them.

whenever you start up *Paradox*.

The macros for Home and End are slightly complicated because, when in FieldView, the Home/End keys do operate as one expects.

Graham Jeffery
London, United Kingdom

Boy, do I agree with Mr. Jeffery. I find *Paradox*'s default assignments for these keys completely counter-intuitive. As a matter of fact, whenever I run *Paradox without* first running the commands shown in Figure 1, I seem to spend an inordinate amount of time fumbling around the screen because the Home, End, Ctrl-Home, and Ctrl-End keys act so differently from what I've come to expect.

If you find *Paradox*'s default use of these keys backward, the commands shown in Figure 1 should help. Each SetKey command tells *Paradox* to execute a certain command sequence whenever the specified key is pressed. You'll note that there's a separate SetKey command for each of the Home, End, Ctrl-Home, and Ctrl-End keys. This way, you can independently redefine what happens when you press each of these keys within *Paradox*.

By placing the SetKey commands in your Init script, you ensure that your key assignments are always active, since *Paradox* executes or *plays* the Init script immediately whenever it starts up.

The *Paradox* Application Language, or PAL for short, includes functions that you can use in your scripts to accomplish various things, including finding out the status of the *Paradox* environment. In the first and second SetKey statements, Mr. Jeffery uses the IsFieldView() function to find out whether or not a table is in FieldView mode, a special mode where the cursor keys move the cursor one character at a time within a field instead of jumping from field to field. If so, he passes the Home and End keys through to *Paradox* to be processed normally. This is because *Paradox* processes these keys in the more familiar way while operating in FieldView mode.

## DEBUGGING USING ON KEY LABEL

I usually include the command SET ESCAPE OFF near the beginning of my programs to prevent the end user from exiting without going through the proper exit routine. But sometimes it isn't convenient to have ESCAPE set off while I'm still coding: A careless mistake can put the computer into an endless loop. With *FoxPro*'s wonderful TRACE window, it's easy to find and fix the error once the TRACE window is opened, but to do so you usually have to reboot the computer twice: once to get out of the loop and open the TRACE window, and a second time to get out of the loop again to fix the error.

With *FoxPro*'s ON KEY LABEL command, I'm able to get out of any program I'm running with one simple keystroke. I now include the following line in each program I write:

```
ON KEY LABEL F10 SUSPEND
```

Now, when I run into a major problem, such as an endless loop that I can't get out of, I can simply hit the [F10] function key and suspend the program instantly. (Of course, I delete this line before distributing the program to the end users, but it's a great timesaver while the coding and debugging process is still going on.) Once suspended, I can view memory, open the TRACE or DEBUG windows, or do whatever else I need to do.

Once that's finished, typing RESUME will let me continue from where I left off in the program. With the ON KEY LABEL command, any key—or even a mouse button—can be used to suspend the program, but I chose F10 because it is easy for me to remember and I won't hit it accidentally. This one simple line has saved me a lot of time and frustration since I started using it a short time ago.

Vincent Harris
Fremont, California

Using ON KEY LABEL F10 SUSPEND can make your life easier, providing you remember to take it out before you produce the final version of your program.

When the SUSPEND command is executed, you are placed in *FoxPro*'s command window and can examine things from there. Since ON KEY LABEL also lets you DO a program or procedure, you can expand this concept to automatically open the TRACE and DEBUG windows when you hit the F10 key. For example, consider the following:

```
* POPTRACE.PRG
ACTIVATE WINDOW DEBUG
ACTIVATE WINDOW TRACE
SUSPEND
RETURN
```

If you assign this program to F10 using

```
ON KEY LABEL F10 DO POPTRACE
```

the DEBUG and TRACE windows will open automatically.

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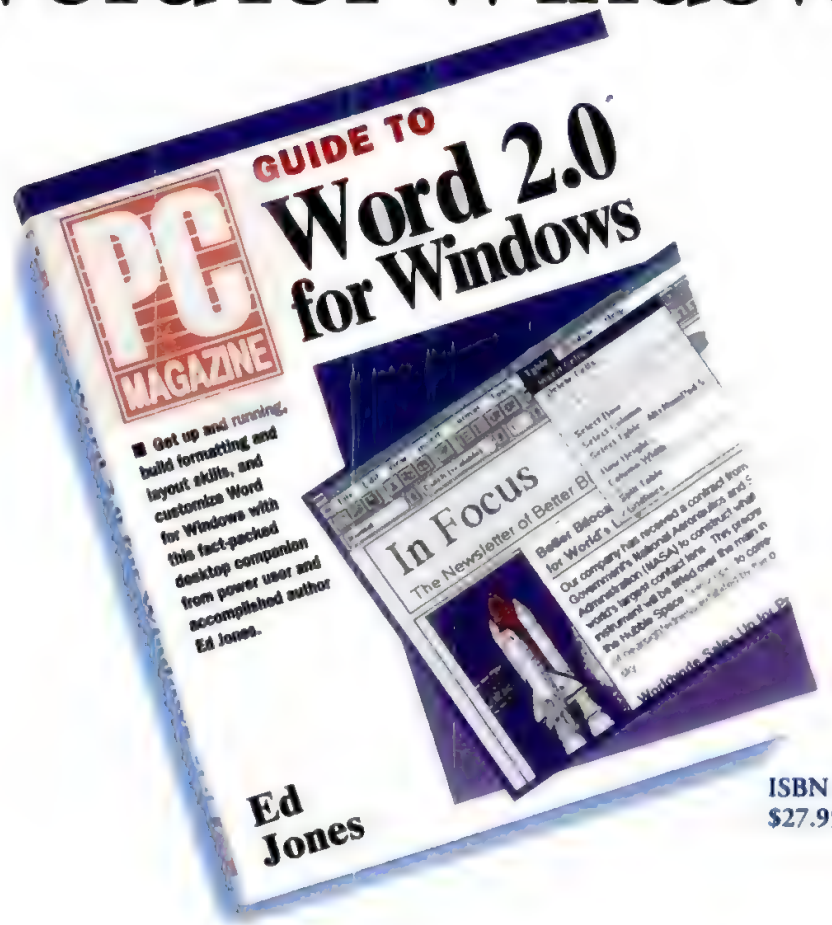


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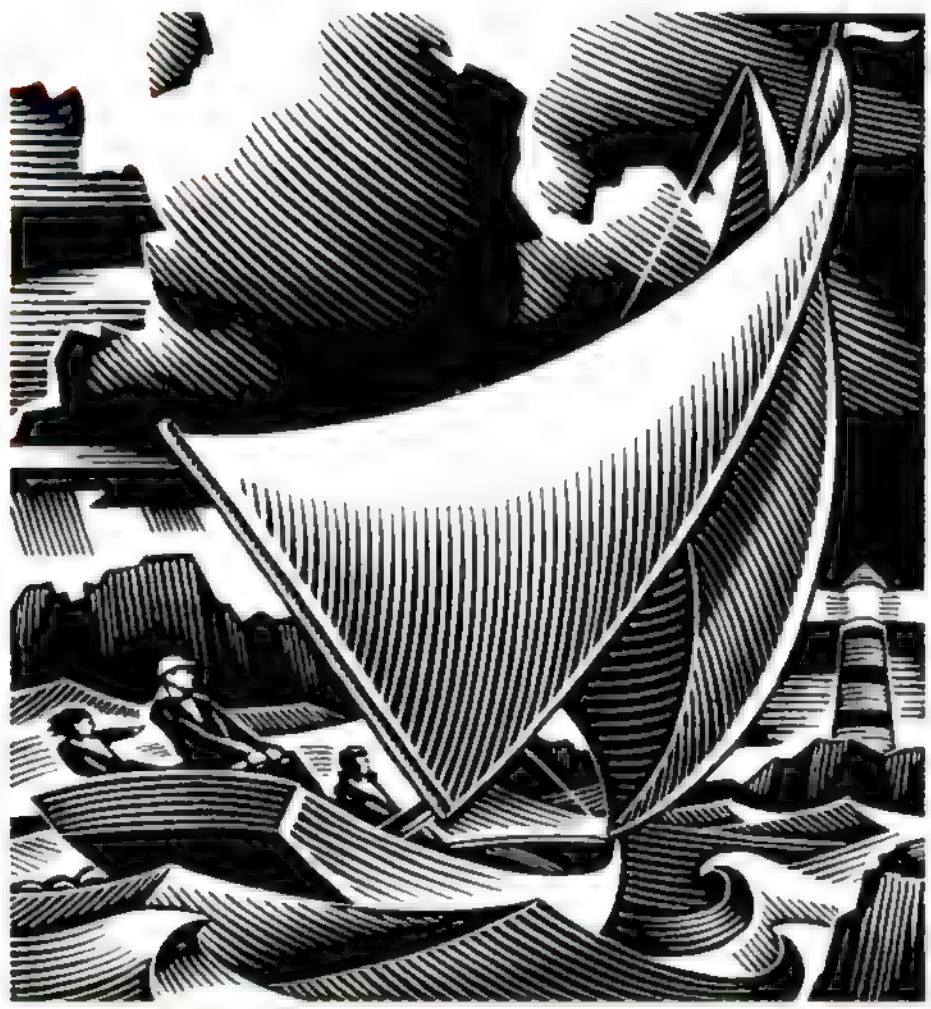

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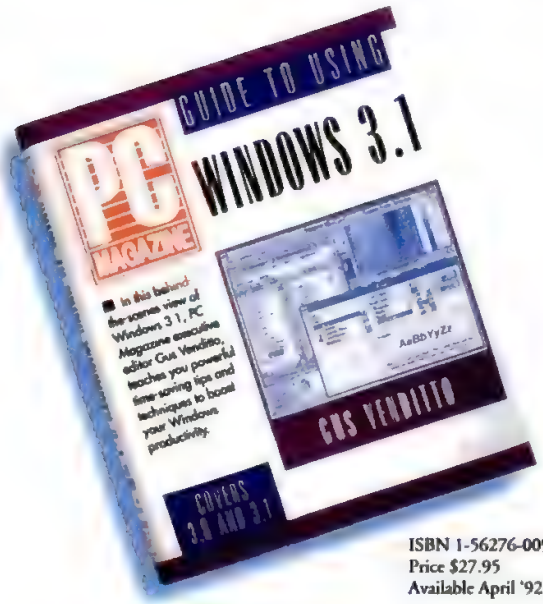


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CIRCLE 350 ON READER SERVICE CARD

edited by
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# Languages

## FIELD VS. TYPE

With the introduction of QuickBASIC, Version 4.0, Microsoft has added a very important feature: user-defined TYPE variables. A TYPE variable offers a real improvement over the FIELD statement, because it lets you clearly see the structure of a random access data file. Further, file operations on TYPE variables are faster and require less code than equivalent operations using FIELD. However, there are limitations inherent with TYPE data that only FIELD can overcome.

The most significant problem is that you can't write a general-purpose database program using the TYPE method. The structure of the data file must be defined at the time the program is compiled rather than at runtime. Therefore, it's impossible to write applications that allow the user to define the number of data fields and their type.

Another restriction is that separate code is required for each file being used. For example, if your program needs to manage six different data files, six different sets of PUT and GET routines will be needed. Each place that data will be read or written, a specific TYPE variable or array element must be identified by name.

- **FIELD VS. TYPE:** Though QuickBASIC's TYPE statement offers advantages over FIELD, for some applications only the latter will suffice.
- **DETERMINING THE DAY OF THE WEEK:** A handy C function lets you find the correct day for any particular calendar date.

The example program in Figure 1 shows how to write generic subroutines using FIELD to open, read, and write any type of random access file.

Christian Mercure
Quebec, Canada

As originally submitted, Mr. Mercure's program was too long to include as a listing here. I therefore shortened it to a more manageable size, though at the expense of some key features. The primary feature not shown is how to accommodate numbers. One method is to include a parallel array of field-type codes, in addition to the arrays for data and field lengths. For example, 1 might mean string data, 2 could indicate integer, and so forth. You could then write a generic subprogram to display the data, and it would know when to use CVI, CVL, CVS, and CVD using a series of IF or CASE statements.

There is yet another problem associated with the use of TYPE variables. When a TYPE variable is dimensioned, space to hold its contents is allocated in near memory. And once it has been allocated, this memory can never be reclaimed for any other purpose. However, if you open a file with the FIELD statement, the necessary buffer memory is relinquished when the file is subsequently closed.

A good way to avoid this problem—aside from using the FIELD statement—is to create a one-element dynamic TYPE array and use that wherever a single TYPE variable is expected. That is, you would use

```
REDIM Array (1 TO 1) AS TypeName
```

FIELD.BAS — COMPLETE LISTING

```
'FIELD.BAS - demonstrates opening, reading, and writing using FIELD

DECLARE SUB OpenFile (FileName$, RecLen%, Dat$(), FldLen%(), FileNum%)
DECLARE SUB ReadFile (FileNum%, RecordNumber%)
DECLARE SUB WriteFile (FileNum%, RecordNumber%)

CONST Max% = 5                  'we'll use five data fields
FileName$ = "FIELD.DAT"         'this is the file name to open
REDIM Contents$(1 TO Max%)      'this holds the file data contents
REDIM Lengths%(1 TO Max%)       'this holds the field lengths

RecLength% = 5                  'this accumulates the total record length
FOR X% = 1 TO Max%              'read the array of field lengths
  READ Lengths%(X%)
  RecLength% = RecLength% + Lengths%(X%)
NEXT

'----- open the data file and assign some sample data
CALL OpenFile(FileName$, RecLength%, Contents$(), Lengths%(), FileNumber%)
FOR X% = 1 TO Max%
  READ Temp$
  LSET Contents$(X%) = Temp$
NEXT

RecNumber% = 1
CALL WriteFile(FileNumber%, RecNumber%) 'write the data to record number 1
CALL ReadFile(FileNumber%, RecNumber%)  'read the data back again

FOR X% = 1 TO Max%                      'display the data to prove it worked
  PRINT "{"; Contents$(X%); "}"
NEXT

CLOSE #FileNumber%                      'close the file

DATA 28, 25, 17, 28, 2
DATA Tony Smith, Abco Corporation, 2299 Baxter Place, Atlanta, GA

SUB OpenFile (FileName$, RecLen%, Dat$(), FldLen%(), FileNum%) STATIC
  FileNum% = FREEFILE                   'get the next available file number
  OPEN FileName$ FOR RANDOM AS #FileNum% LEN = RecLen%    'open the data file
  NumFields% = UBOUND(FldLen%)          'see how many fields there are
  Pad = 5                               'accumulates the padding needed
  FOR X% = 1 TO NumFields%
    ThisLen% = FldLen%(X%)              'see how long this field is
    FIELD #FileNum%, Pad AS Dummy$, ThisLen% AS Dat$(X%)  'field it
    Pad = Pad + ThisLen%                                  'advance the pad
  NEXT
END SUB

SUB ReadFile (FileNum%, RecordNumber%) STATIC
  GET #FileNum%, RecordNumber%
END SUB

SUB WriteFile (FileNum%, RecordNumber%) STATIC
  PUT #FileNum%, RecordNumber%
END SUB
```

**Figure 1:** These three subprograms show the steps needed to open, read, and write any type of random access data file.

and then use Array(1) each time data is being read or written. Then when you close the file, you can also erase the array.—*Ethan Winer*

## DETERMINING THE DAY OF THE WEEK

After years of looking at submissions to this column, it's no surprise to me that a C programmer might get so involved in writing great programs that he'd forget to include his name and address. In fact, that's just what happened with this submission.

Date calculations are a necessary evil in programming, so finding a new and useful date function is always handy. Calculating the day of the week for a particular calendar date is useful whether the application is an accounting system, a data entry form, or a pop-up calendar: It takes a number of calculations, but it's handy nonetheless.

This technique contains a function, dow, which takes three integer parameters: the month, the day of the month, and the year. It returns an integer that represents the day of the week (starting with 0 for Sunday). The nice thing about it is that you can just as easily embed the function in an application, include it with your favorite library functions, or create a command line utility out of it.

The function performs many calculations in one expression. First, it computes the number of days that have passed in all years prior to the specified year (including leap years). Next, it totals all the days that have passed in that year, up to that date. The result is divided by 7, and the remainder (in a range from 0 to 6) is the day of the week for the date specified.

The original version of the function used a table of integers to represent the days accumulated in each month. I changed this to a table of signed characters to represent the difference between the last day of the previous month and 30—assuming each month was 30 days long. Thus, for February the number is 1 (since January is a 31-day month), and for March the number is -1 (since, except in leap years, January and February together are 59 instead of 60 days). To calculate the number of days that have passed that year, the function uses this number, plus the month number times 30 to calculate the day number of a date in the year. Using the byte-based array makes the function more compact while adding only a tiny piece of code.

A small program, DOW.C, is presented in Figure 2 to show off the dow function. The program takes a command line argument, such as 12 25 1992. If none is supplied, the program prompts you for it. Then it calls the function and prints the day of the week that the date falls on. Note that, as written, DOW relies on the user for correct input. There's no error checking, and if, for example, you enter a day or month that's too large or if the format is incorrect (such as 12 25 92), the wrong day will be generated.

You can compile DOW.C with either Borland C++ (2.0 or 3.0) using `BCC DOW.C` or Microsoft C (5.1 or 6.0) using `CL DOW.C`. Try out DOW.EXE and see what trivia you can uncover. I found, for instance, that based on our current calendar system, July 4, 1776, fell on a Thursday. And I tracked my birthday well into the next half-century. In any case, to the routine's anonymous donor: nice job! This one's quick and easy to use.
—*Richard Hale Shaw*

DOW.C — COMPLETE LISTING

```
// dow.c
#include<stdio.h>
#include<stdlib.h>

int dow(int month, int day, int year)
    {
    const signed char calendar[12] =
        {
        0, 1, -1, 0, 0, 1, 1, 2, 3, 3, 4, 4    // base 30
        };
    return
        (( ((year-1) * 365L)        // # days of normal years, previous
           + ((year-1) / 4)         // # of possible leap days
           - (((year-1) / 100)      // # of non-century leap days
           - ((year-1) / 400)
           )
                                    // # of days in month passed
        + (calendar[month-1] + ((month-1)*30))
        + ((
          ((year % 4 == 0) && (year % 100 != 0)) || (year % 400 == 0))
           && (month > 2)
           )
        + day)
        % 7);
    }


void main(int argc, char **argv)
    {
    int day, month, year;

    const char *daystr[7] =
        { "Sun", "Mon", "Tue", "Wed", "Thu", "Fri", "Sat" };

    if(argc != 4)
        {
        printf("Enter date [mm dd yyyy]: ");
        scanf("%d %d %d", &month, &day, &year);
        }
    else
        {
        month = atoi(argv[1]);
        day = atoi(argv[2]);
        year = atoi(argv[3]);
        }
    printf("%02d/%02d/%04d is on %s\n",
        month,day,year, daystr[dow(month,day,year)]);
    }
```

**Figure 2:** This program contains a function that finds the correct day of the week for any calendar date. Since there is no error checking, it relies on the user for correct input.

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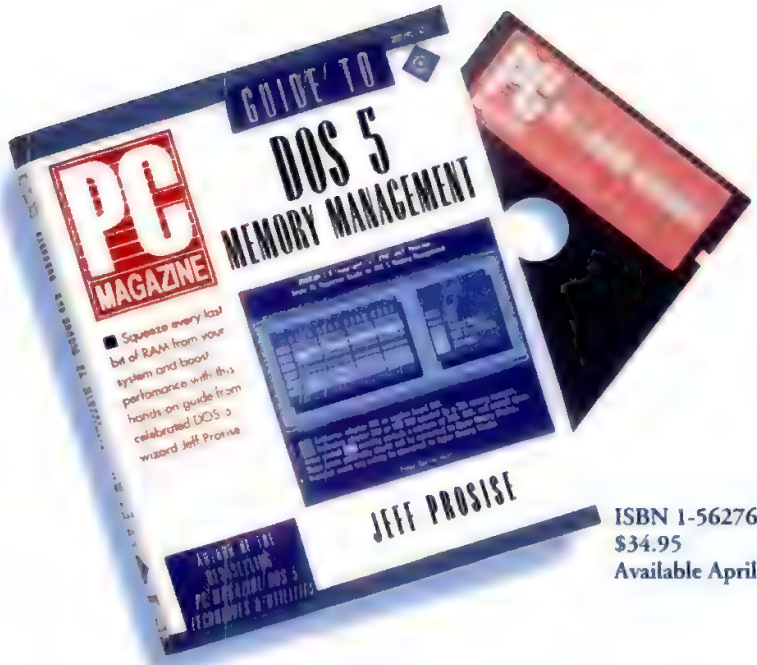


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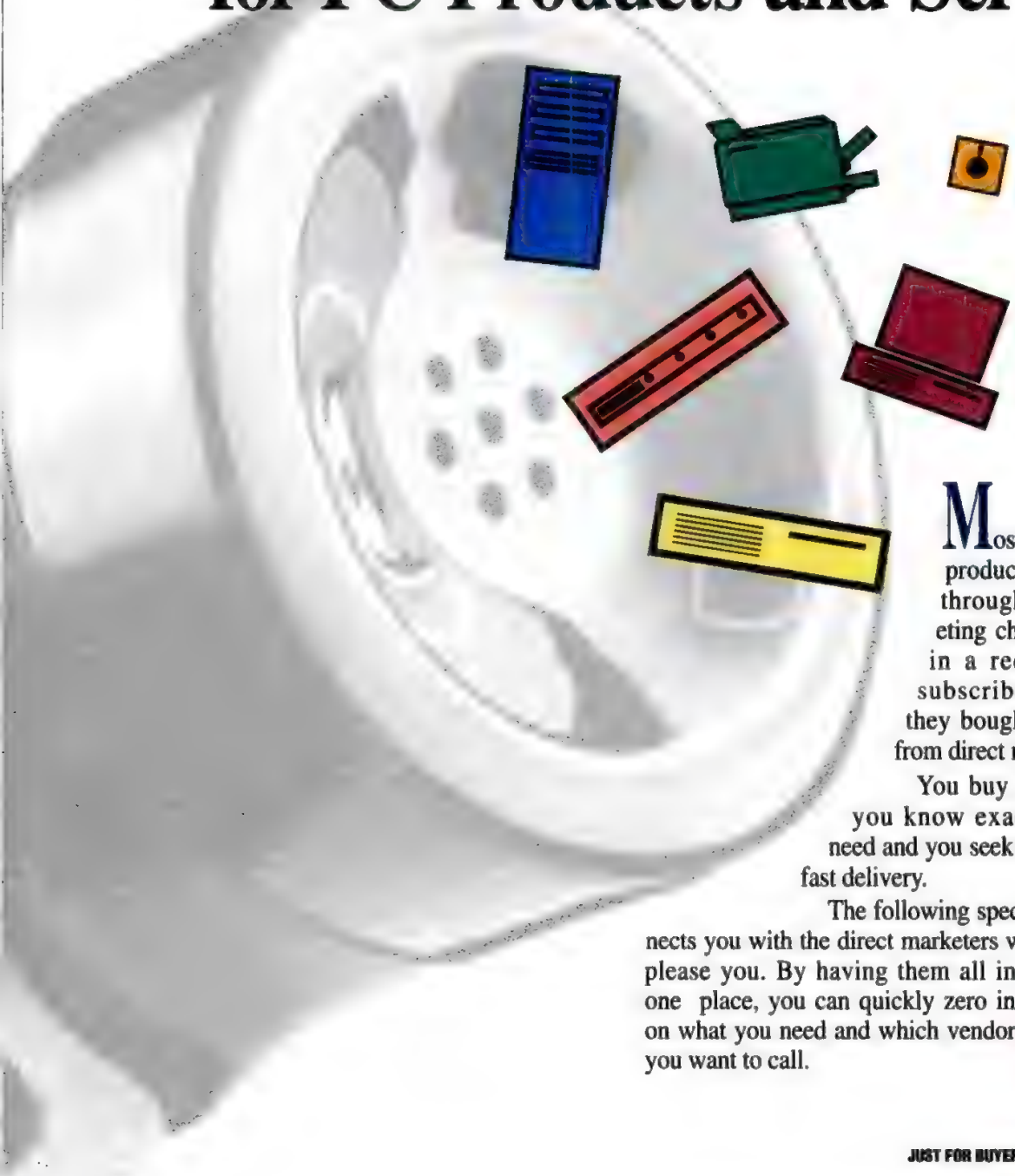
CIRCLE 017 ON READER SERVICE CARD

# *PC Magazine's* Direct Marketing Connection for PC Products and Services



Most of you buy PC products and services through direct marketing channels. In fact, in a recent study of subscribers, 83% said they bought PC products from direct marketers.*

You buy direct because you know exactly what you need and you seek good value and fast delivery.

The following special section connects you with the direct marketers who are eager to please you. By having them all in one place, you can quickly zero in on what you need and which vendor you want to call.

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* *PC Magazine* Subscriber Study of Purchasing of PC Products through Direct Marketers, 1989.

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| T2200 SX - 60 Mb, VGA | |
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| **AST** | |
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| ML 391 - Dot Matrix | $629.00 |
| ML 393 - Dot Matrix | $989.00 |
| ML 393c - Color Dot Matrix | $1069.00 |
| OLC 400 - 4ppm, Laser Printer | Call |
| OLC 800 - 8ppm, Laser Printer | Call |
| **Hewlett Packard** | |
| LaserJet III - 4ppm, Laser Printer | |
| 2P Laser Printer | |
| LaserJet IIO | |
| H.P. DeskJet 500 - (ink) | |
| LaserJet IIIP - 4ppm | |
| LaserJet IIISi - 17 ppm | |
| **Epson** | |
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| LQ-870 24-PIN, Narrow | $469.00 |
| LQ-1170 24-PIN, Wide | $649.00 |
| FX-850 9-PIN, Narrow | $314.00 |
| FX-1050 9-PIN, Wide | $449.00 |
| EPL-7500 Laser Printer | Call |
| Action Laser II | Call |
| **Canon** | |
| BJ 300 | $469.00 |
| BJ 330 | $639.00 |
| BJ 10EX Portable | $339.00 |
| **QMS** | |
| PS-410 - 4ppm | $1629.00 |
| PS-815 - 8ppm | $2995.00 |
| Model 30i | $8499.00 |
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| 5d 20" Multisync Monitor | |
| 5fg 17" Monitor | |
| 6fg 20" Monitor | |
| 2A 14" Monitor | |
| **Samsung** | |
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| 14" White VGA Monitor | $119.00 |
| 17" CSA 7571 Monitor | $879.00 |
| **Panasonic** | |
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| 1395 SVGA 14" *(non-interlaced)* | $499.00 |
| C1991 SVGA 20" *(non-interlaced)* | $1799.00 |
| **Mitsubishi** | |
| HL 6605 16" Monitor | $1019.00 |
| HL 6945 20" Monitor | Call |
| **Seiko** | |
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| Video 7 VGA 16 | $92.00 |
| VRAM II 512k | $255.00 |
| VRAM II 1 Mb | $355.00 |
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| ATI Integra | Call |
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| VGA Wonder XL *w/ mouse 512k* | $199.00 |
| VGA Wonder XL *w/mouse 1 Mb* | $215.00 |
| 8541 Ultra 512k | $479.00 |
| 8541 Ultra 1 Mb | $499.00 |
| Vantage 512k *w/mouse* | $349.00 |
| Vantage 1 Mb w/mouse | $369.00 |
| Graphics Ultra 1 Mb *w/mouse* | Call |

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|---|---|
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| 2 Mb | Call |
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| 240 Mb Quantum LPS | |
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| 105 Mb Quantum LPS, 12ms | $349.00 |
| 120 Mb Maxtor, 15ms | $359.00 |
| 120 Mb Quantum LPS, 11ms | $439.00 |
| 213 Mb Maxtor, 15ms | $589.00 |
| 240 Mb Quantum LPS, 11ms | $739.00 |
| 340 Mb Maxtor, 13ms | $989.00 |
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| 425 Mb Fujitsu, HH, 12ms | $1189.00 |
| 520 Mb Fujitsu, HH, 9ms | $1249.00 |
| 535 Mb Maxtor, 11ms | $1449.00 |
| 672 Mb Fujitsu, FH, 16ms | Call |
| 760 Mb Maxtor, 13ms | $1499.00 |
| 1.08 Gb Fujitsu, FH, 14.5ms | Call |
| 1.2 Gb Maxtor, 13ms | $2169.00 |
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| 120 Mb Maxtor, 15ms | $429.00 |
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| 240 Mb Quantum LPS, 11ms | $809.00 |
| 340 Mb Maxtor, 13ms | $1079.00 |
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| 760 Mb Maxtor, 13ms | $1559.00 |
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| 2400 V.42BIS External | $199.00 |
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| 2400 SA | $179.00 |
| 2400 Pocket | $109.00 |
| 9600 V.32 | $459.00 |
| 9600 V.32 Internal | $389.00 |
| Fax Modem 2400 | Call |
| Fax Modem 9600 | Call |
| **US Robotics** | |
| V.32 BIS 9600 Internal | Call |
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|---|---|
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| **Sony** | |
| CDU-7201 External | |
| CDU-535 Internal | |
| CDU-54101 Internal SCSI | |
| SMO-S501 650 Mb M-O | |
| **Toshiba** | |
| 3301 External | |
| 3301 Internal | |
| CDR 73 External | |
| CDR 83 Internal | |
| CDR 36 External Portable | |
| **NEC** | |
| CDR 36 External Portable | $449.00 |
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CIRCLE 016 ON READER SERVICE CARD

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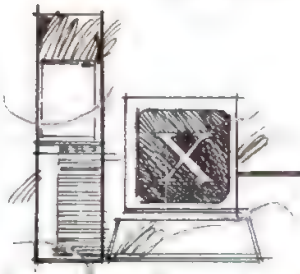

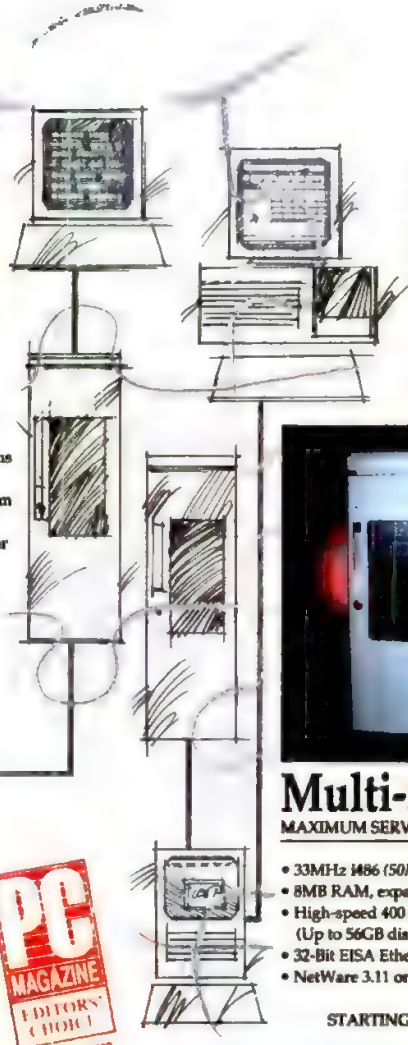

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PC MAGAZINE EDITORS' CHOICE February 11, 1992 Model 433e

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PC WEEK LABS "Tangent Leads in Performance" Jan 7, 1991 Tangent Multi-Server 433e

PW Personal Workstations Proving Ground August 1990

BYTE LAB "The Multi-Server Excelled Under UNIX" February 1992

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# FAST MICRO Hardware 1-800-441-FAST

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- Sony Int. 680mb Kit ..... 349
- Book of Mammels / Encyclopedia .. 49/69
- MS Bookshelf, Stat. Pack, World Atlas & Consultant CDs ..... 99

**Colorado**
- DJ-10 40-120mb Int. Tape ..... 199
- DJ-20 80-240mb Int. Tape ..... 259
- External Kit w/AB11 ..... 99

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- CP3044 40mb IDE 28ms ..... 199
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**DTC**
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- 6280-15T 24mbit/sec transfer rate ..... 169

**Micropolis** (see DTC Controllers)
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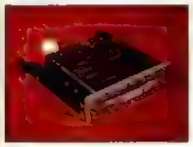
**NEC** Ext CD Gallery w/CDR36 ..... 559

**Plus Development**
- HardCard IIXL 50mb 9 ms 16bit ..... 299
- HardCard IIXL 105mb 9 ms 16bit ..... 469

### Toshiba 1.44mb Floppy $59



Complete with mounting brackets and installation instructions, this Toshiba works in all true 286 & 386 compatibles. Will also read/write/format 720K 3.5" disks. Rails, add $5

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- 40MB AT ST251-1 MFM Drive ..... 229
- 40MB AT ST351X 28ms IDE Drive ..... 179
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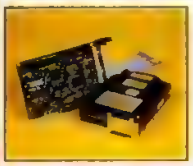
- 125MB ST3144A 19ms IDE Drive ..... 369
- 210MB ST1239A 15ms IDE Drive ..... 599
- 330MB ST2383E 16ms ESDI Drive 1199

### Seagate 89mb AT Kit $339



IDE performance, big 89 megabyte capacity, 19ms access time and 5 mbps transfer rate make this a great buy. Controller, cables and rails are included to make installation fast and easy.

**Teac**
- 1.2MB 5.25" Floppy ..... 59
- 1.44MB 3.5" Floppy ..... 59

**Toshiba**
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- 1.2MB 5.25" Floppy ..... 59
- 1.44MB 3.5" Floppy ..... 59

**Western Digital**
- WD93044 40mb IDE 28ms ..... Call
- WDAC280 80mb IDE 20ms ..... Call
- WDAP4200 200mb IDE 20ms ..... 599

## MODEMS & FAX

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- 9600/E External MNP V.42bis ..... 369

**Everex** 2400B Int Modem ..... 65

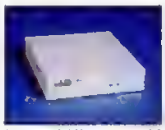
### ATI 9600ETC•E $369

ATI delivers speed and accuracy with the 9600 Etc•E! It includes V.42 LAP-M, and MNP error correction combined with MNP5 and V.42bis data compression to provide total high speed throughput. It features automatic line speed correction, synchronous/asynchronous communication and automatic feature negotiation with connecting with other modems.

**Hayes**
- JT FAX 4800B Internal ..... 139
- Personal Modem 2400 w/Prodigy ..... 119
- Pocket Edition 2400 Modem ..... 119

**Intel**
- Classic 2400 Modem Int./ Ext. ..... 139/169
- Satisfaxtion Classic - Intl 9600 ..... 369

### OmniLink Laser $379



Don't settle for curled up thermal paper or tie up your PC to receive faxes get Omni ink Laser. It connects to your phone line and HP compatible laser and receives and prints your faxes. You can still print anytime you want and OmniLink will store up to 30 faxes while your printing. Plus, its a standard 2400/9600 modem/sendfax and software is only $89

**Practical Peripherals**
- 2400B Int Modem Std/MNP ..... 79/119
- PM9600SA Ext. V.32/V 42bis ..... 299

**USRobotics**
- 2400 Sportster Int / Ext. ..... 119/135
- 2400 Sportster MNP Int / Ext. ..... 159/189
- 9600 Sportster Int / Ext. ..... 399/449
- Couner HST 14,400 Int. / Ext. ..... 539/559
- Couner HST 14,400 Dual Std Ext. ..... 799

**ZOOM**
- HC2400 Internal ..... 69
- 2400 V 42bis External Modem ..... 125
- 9624 Send/Receive Int Fax Modem ..... 105

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**Key Tronic** 101 Keyboard ..... 59
- Professional Mouse ..... 59

**Logitech**
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- Mouseman Senal with Windows ..... 95
- Mouseman Bus nghthand ..... 65
- Mouseman Cordless ..... 85
- ScanMan 32 ..... 139
- ScanMan 32 with Catchword ..... 179
- ScanMan 256 for Windows ..... 259
- Trackman Senal ..... 65

### Microsoft Mouse $83

Ergonomic design and 400 DPI accuracy make this the world's most popular mouse. Microsoft design and mouse utilities assure compatibility with the programs you use most.

**Microsoft**
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- Senal or Bus with paint ..... 95
- Senal with Windows ..... 147

**Z-Nix** Super Mouse II w/Windows ..... 79

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**Artisoft/Lantastic**
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- Ethernet ..... 469
- Ethernet Additional Stations ..... 209

**Eagle** NE2000 2 Station NW Lite Kit. ..... 459

**FastData** NE2000 16 Bit 10-BaseT ..... 109

**Novell**
- Netware Lite ..... 65
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## BOARDS & CHIPS

**Adlib** Gold 1000/2000 ..... 185/285

**ATI** Stereo F/X ..... 129

**Brown Wagh**
- Sound Blaster ..... 105
- Sound Blaster Pro (stereo & MIDI) ..... 179

**Cyrix** 387-DX25 /33 ..... 179/189
- 387-SX16 /20 /25 ..... 109/119/129

**Everex**
- RAM3000 16 bit - w/ 0K (max 3mb) ..... 75
- RAM3000 16 bit - w/ 1mb ..... 125
- RAM8000 16 bit - w/ 0K (max 8 mb) ..... 169
- RAM8000 16 bit - w/ 2mb ..... 269

**Intel** 287XL ..... 75
- 387-DX25 or 33 ..... 209
- 387-SX16 / 20 ..... 119/129

**Memory** - 1mb SIMMS 80ns ..... $49

**Memory** - 1mb chips 80ns set of 9 ..... $59

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The FastData 16 bit VGA card features 256K or 512K of video memory, does CGA, EGA, & VGA up to 1024x768 (512K vers.) and comes with drivers for popular software, including Windows. It comes with a 30 day money back guarantee.

- FastData 16bit 1mb VGA ..... 89
- FastData CGA Card ..... 35
- FastData MGP Card ..... 29

### FastData Monitors

Your best value guaranteed! We have full line manufactured for us by name factories like Hyundai and Matsushita. As with all FastData branded product you get a full 30-day money back satisfaction guarantee. Shown is the VGA color.

**FastData Boards**
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- 9600B Send/Receive Fax w/2400B ..... 99
- Ethernet 16bit 10Base-T ..... 109
- IDE 16 Bit 1:1 Hard/Floppy Disk Cont ..... 29
- IDE HD/FD w/Par/2 Serial/Game ..... 39
- Parallel/2 Serial/Game Card ..... 29
- RLL 16bit 1:1 Hard/Floppy Disk Cont ..... 59
- XT 1.44 Dual Floppy Controller ..... 35

### FastData 2400 Baud Modem $49

The FastData 2400 baud internal modem is fully Hayes compatible and can be configured to COM port 1-4. It has an internal speaker, is auto answer & auto dial, and comes with communications software.

**FastData Monitors**
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- Mastering WordPerfect Windows ..... 21
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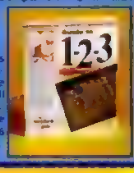

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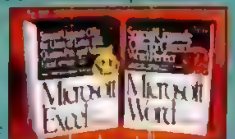

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| Disk Optimizer | 29 |
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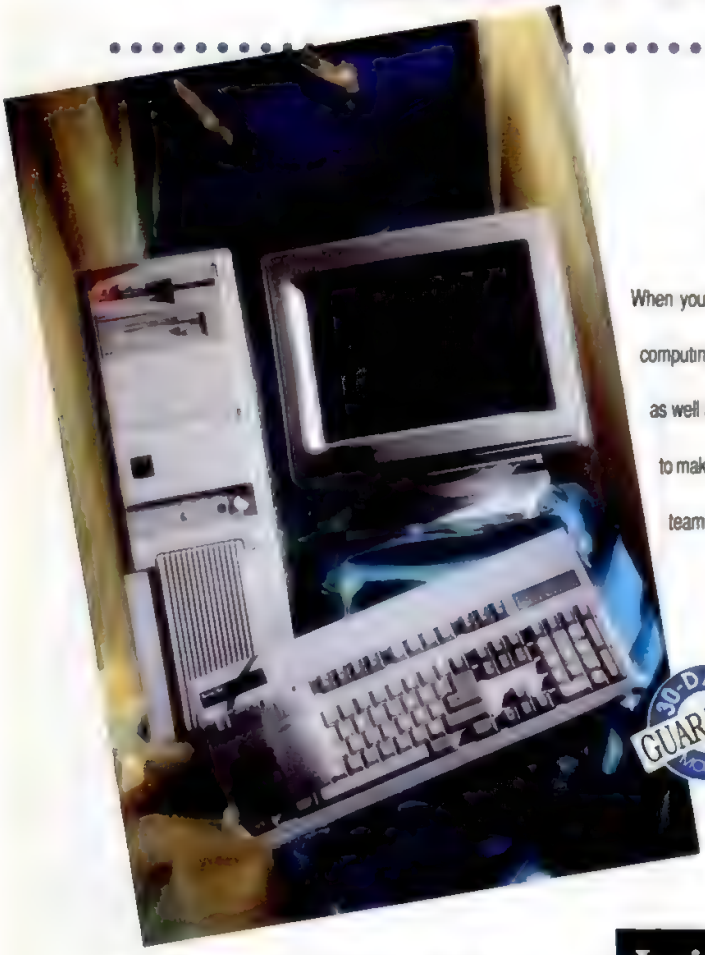

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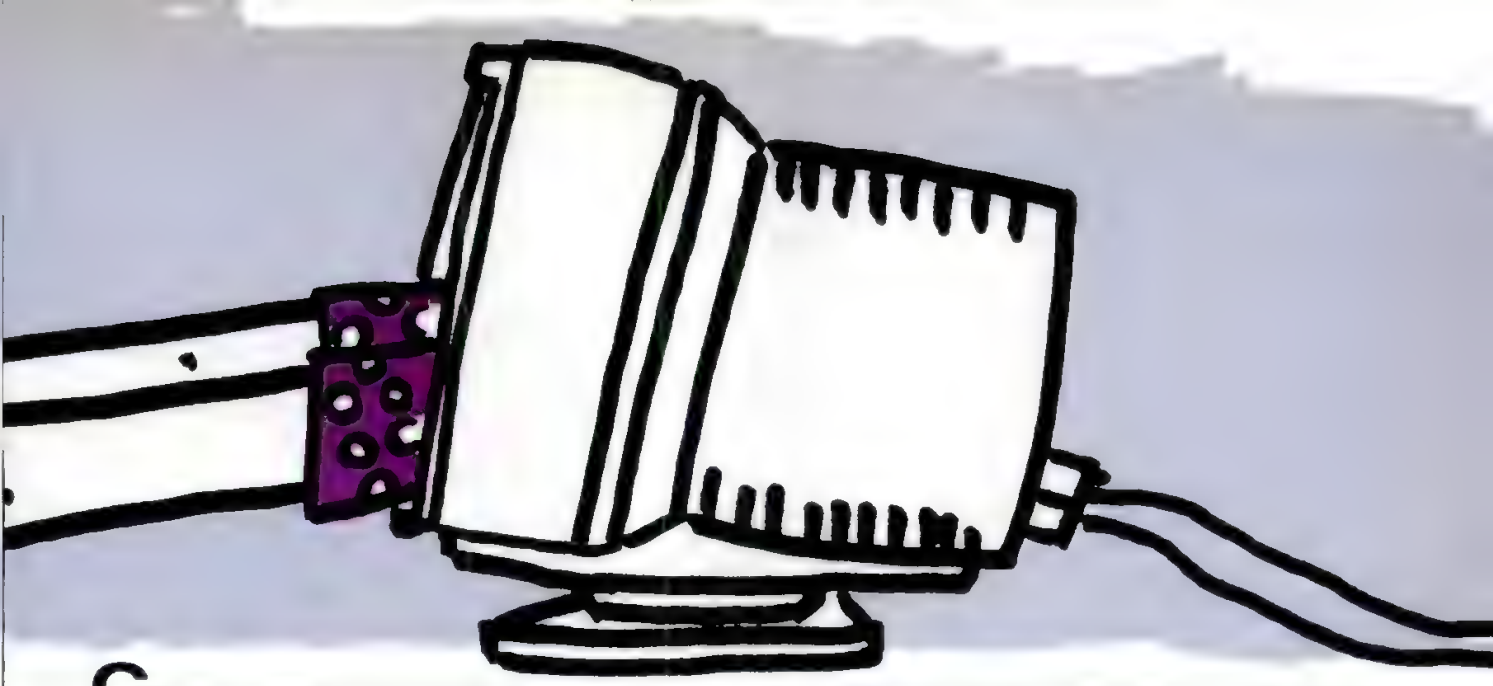

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| IDE 120 / 240 MG LPS | $345/$619 |
| SCSI 52 / 105 MG LPS | $205/$335 |
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| SCSI 425 ProDrive FREE DELIVERY | $1,399 |
| 210 Pro Drive IDE/SCSI | $639/$659 |

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| ADAPTORS: | AB11 External | $37 |
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| ADAPTORS: | FC10 Internal | $79 |
| | KE10 External | $109 |
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| 44/2 Dual | Call |
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| 88IL Internal Kit w/8 bit Adaptor | $589 |
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| Accelerator Board 4100 for Plus Series | $119 |

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| Articom | $219 |
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| AI Unlimited (up to 300 users) V4.1 | $1,349 |
| AI Expansion ( 5-300 users) | $1,079 |

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| KX-P 1123 | $195 |
| KX-P 2180 with Color Kit | $175/$219 |
| KX-P 1124i | $279 |
| KX-P 1624 | $337 |
| KX-P 2624 | $359 |
| KX-P 1654 | $535 |
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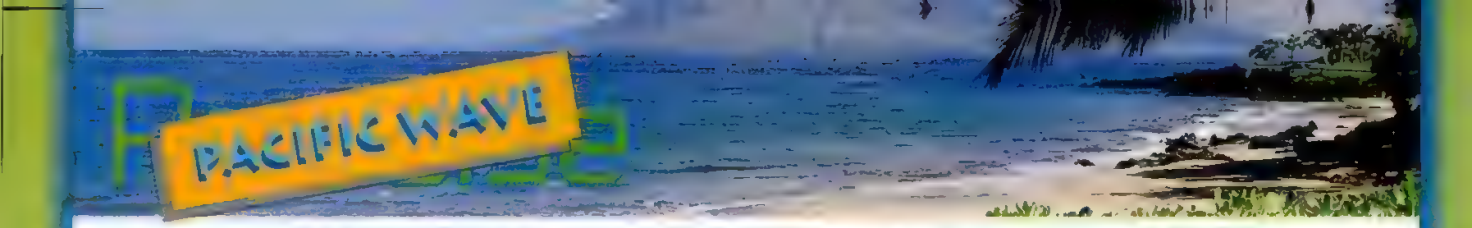


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EDITORS' CHOICE
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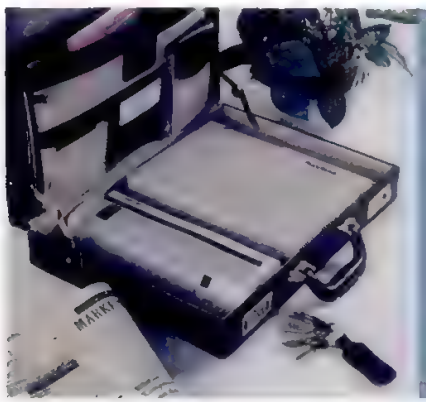

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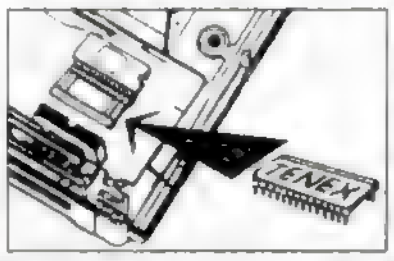


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| Everex Tempo LX 20 40/60MB | CALL |
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| Sharp PC6220 286 VGA 20MB | 999 |
| Texas Instruments TM2000 | 999 |
| Texas Instruments TM3000 | CALL |
| Texas Instruments 386/WINSX | NEW |
| Toshiba T2000SX 40MB | 1849 |
| Toshiba T2000SXE 60MB | 2629 |
| Toshiba T2200SX 40MB/60MB | CALL |
| Toshiba T3200SXC 120MB color | CALL |
| Toshiba T4400SX 80MB | NEW |

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| AST Premium II 386/33 model 5 | 2399 |
| Compaq Deskpro 386S/20 w/80MB | CALL |
| Compaq Deskpro 386/20E w/124MB | CALL |
| Compaq SystemPro | ALL MODELS |
| DTK 286/386/486 custom quotes | CALL |
| Packard Bell all models | CALL |
| Smith Corona ALL MODELS | CALL |
| Wyse Terminals 30/50/60 | 294/375/298 |

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| Maxtor ALL MODELS | CALL |
| Micropolis ALL MODELS | CALL |
| Pacific Rim External floppy drives | CALL |
| Plus Hardcard II XL 50MB | 298 |
| Plus Hardcard II XL 105MB | 437 |
| Seagate ST251-1 40MB MFM | 242 |
| Seagate ST3096A 89mb 16ms IDE | 299 |
| Seagate ST3144A 130mb 16ms IDE | 379 |
| Seagate ST1239A 211mb 15ms IDE | 595 |
| Teac 3.5" and 5.25" floppies | CALL |
| Toshiba 1.2MB 1.44MB | 69 |

## MATH CO-PROCESSORS

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|---|---|
| Cyrix 80387DX 20/25 | 149 |
| Cyrix 80387DX-33 | 162 |
| Intel 80287XL | 85 |
| Intel 80387SX-16 | 124 |
| Intel 80387SX-20 | 134 |
| Intel 80387DX-20/25/33 | 199 |
| Weitek ALL MODELS | CALL |

## MEMORY PRODUCTS

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|---|---|
| 2MB for T1000SE XE & T2000SX | 269 |
| 2MB for T.I. TM3000 | 199 |
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| 1MB for Texas Instrmt laser printers | CALL |
| 256x4 80ns DRAM | 5.50 |
| 256x9 80ns SIMM | 17.00 |
| 1MBx9 80ns SIMM | CALL |
| 4MBx9 80ns SIMM | CALL |

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| Logitech Mouseman | 79 |
| Microsoft bus or serial 400 dpi | 89 |
| Microsoft mouse w/windows 3.0 | 149 |
| Microsoft Ball Point mouse | 125 |

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| KXP1654 | 535 |
| KXP2624 | 369 |
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| KXP4455 Laser | CALL |

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|---|---|
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| P9300 | 869 |
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| LC95 Postscript | NEW |
| ColorMate Postscript | 4499 |

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| 180si | 295 |
| Color4 inkjet | 599 |

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| 320/321 | 314/438 |
| 390+/391+ | 439/595 |
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| Laser 400 | 595 |
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| Laser 830 | 1308 |
| Laser 840 | 1594 |

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| Deskjet 500C | NEW |
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| LaserJet III | 1529 |
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| BJ300/330 | 449/599 |

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|---|---|
| NX1001 | 147 |
| NX1020R Color | 185 |
| NX2420R Color | 305 |
| XB2420 Color | 469 |
| LaserPrinter 4 | 859 |

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| Crystal Express | CALL |

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|---|---|
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| LT 20/SL 90+ | 299/319 |

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|---|---|
| GSX 140+/145 | 299/399 |
| PN48 notebook | 299 |

### QMS

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|---|---|
| 410 Postscript | 1499 |
| 815/815MR | 2869/3905 |
| 825/825MR | 3359/4625 |
| Colorscript 10P | 4859 |
| Colorscript 10 | 5729 |

### TEXAS INSTRUMENTS

| | |
|---|---|
| Microlaser Basic | 899 |
| Microlaser Basic XL | 2149 |
| Microlaser PS17+ | 1197 |
| Microlaser PS35+ | 1497 |
| Microlaser XL PS17 | 2489 |
| Microlaser XL PS35 | 2799 |

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|---|---|
| FX-850 | CALL |
| LQ-570 | CALL |
| LQ-870 | CALL |
| Action Laser II | NEW |
| DFX-5000 | 1389 |
| DFX-8000 | 2229 |

### SEIKO

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|---|---|
| Smart Label Printer+ | 174 |

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| HP Paper Cassette Trays | IN STOCK |
| Pacific Data 25-in-1 cartridge | [illegible] |
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| Pacific Data Pacific Page Kit | CALL |
| Pacific Data Postscript cart HP IIP/IIP | [illegible] |
| LASERJET ALL MODELS | CALL |

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|---|---|
| American Power BK400 desktop | 178 |
| American Power AP400 slimline | 305 |
| American Power AP600 slimline | 433 |
| American Power AP900 slimline | 609 |
| American Power Surge Arrest Plus | [illegible] |
| Tripp-Lite BC-500 | [illegible] |
| Tripp-Lite [illegible] | [illegible] |
| Tripp Lite Iso Bar 4 | 44 |

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|---|---|
| Cardinal 2400 baud int MNP 5 | 99 |
| Calpak 2496 send/rec fax modem | 139 |
| Intel Satisfaxtion Board | IN-STOCK |
| Intel 9600E external | CALL |
| Megahertz modems for all laptops | CALL |
| Practical Peripherals 9600SA | 475 |
| US Robotics Courier 2400 MNP 5 | 279 |
| Worldport Fax Modems for laptops | [illegible] |
| Zoom V 42 bis w/mnp external | 129 |

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|---|---|
| NEC CDR 36 portable | 386 |
| NEC CDR 73M external | 599 |
| Toshiba ALL MODELS | CALL |
| Sony CDU 535 internal | 349 |
| Sony External CD-ROM | CALL |

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|---|---|
| Adobe Type Manager | 59 |
| Adobe Illustrator | 305 |
| Aldus Pagemaker 4.0 | 469 |
| Borland Quattro Pro | 304 |
| Caere Omnipage | 449 |
| Caera WordScan Plus | 649 |
| Caera Faxgrabber | 99 |
| Central Point PC Tools 7.01 | 119 |
| Corel Draw 2.0 | 359 |
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| Kurta 12x12 XLP 12x17 IS/one | 287/537 |
| Summagraphics 12x12 12x18 | 329/599 |

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| Colorado DJ-20 120-250MB int | 252 |
| Colorado QFA-700 250-700MB int | 705 |
| Irwin A120PC 40-120MB int | 249 |
| Irwin 80SX 80-250MB int | 235 |
| Maynard XL5540 40MB | 249 |
| Maynard VP150i | 869 |
| Mountain 40MB int/ext | 249/CALL |
| Mountain FS8000 int | 519 |

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| Keyboards XT/AT | 69 |
| Printer stands (all dot matrix) | 9.95 |

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| Hewlett Packard Scanjet+ 2C color | CALL |
| Intel Satisfaction board scanner | 279 |
| Logitech Scanman 256 w/perceive | 319 |
| Microtek Scanmaker 600G | 849 |
| Microtek Scanmaker 600Z | 1329 |

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|---|---|
| Goldstar 1460+ 14" 1024x768 .28mm | 319 |
| Idek MF5117 17" 1024x768 | CALL |
| Idek MF5217 17" 1024x768 .26mm | CALL |
| Mitsubishi HL6605 16" 1024x768 | 959 |
| Mitsubishi HL6945 20" 1280x1024 | 1785 |
| Nanao 9070U 16" 1024x768 .28mm | 959 |
| Nanao 9080i 16" 1280x1024 | 1119 |
| Nanao T560i 17" 1280x1024 .26mm | 1999 |
| NEC 5D 20" multisync 1280x1024 | 1995 |
| NEC 3FGX 15" 1024x768 .28mm | NEW |
| NEC 4FG 15" 1024x768 .28mm | NEW |
| NEC 5FG 17" 1280x1024 .28mm | NEW |
| NEC 6FG 21" 1280x1024 .28mm | NEW |
| Packard Bell 8511 14" 1024x768 .28mm | 299 |
| Panasonic C-1381i 14" 1024x768 | 339 |
| Panasonic C-1395 14" 1024x768 ni | 469 |
| Princeton Ultra 1200/Ultra 1400 | CALL |
| Samsung ML 4571 14" mono VGA | 129 |
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| Seiko 1440/1450 14" VGA .25mm | 489/635 |
| Seiko 1780 17" 1280x1024 .25mm | NEW |
| Seiko 2050 20" 1024x768 .31mm | 1919 |
| Sony CPD1304 14" 1024x768 .25mm | 579 |
| Sony CPD1604S 17" 1024x768 .25mm | NEW |
| Zenith 1492 14" flat tension VGA | CALL |

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| ATI VGA Wonder XL w/mouse 1MB | 190 |
| ATI 8514/Ultra 1MB | CALL |
| ATI Vantage 512k/1MB w/mouse | CALL |
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| Cardinal-700 1024x768 512K/1MB | 138/159 |
| Diamond Stealth Hi-Color | CALL |
| Hercules Gold series | CALL |
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| Orchid Pro Designer IIs 1MB | 219 |
| Orchid Farenheit 1280 | 325 |
| Paradise 8514/A+ | 489 |
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|---|---|
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| Digiboard ALL MODELS | CALL |
| Lantastic Ethernet Starter Kit | 469 |
| Netware 2.2 5-user | 482 |
| Netware 2.2 50-user | 1945 |
| Netware 3.11 5-user | 599 |
| Netware 3.11 10-user | 1389 |
| Netware 3.11 20-user | 1889 |
| Netware 3.11 50-user | 2699 |
| Netware 3.11 100-user | 3660 |
| Netware 3.11 250-user | 6999 |
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| SMC Arcnet PC130/270E | 98/124 |
| SMC Arcnet PC500WS/PC500FS | 179/289 |
| Tiara 0111/0105 | 79/139 |
| Thomas Conrad 6245 Arcnet 16-bit | 209 |
| Western Digital Elite/Elite16 | 145/169 |
| Xircom pocket lan adapters | CALL |

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| Panasonic UF300 plain paper | 1499 |
| Sharp FO240 | 659 |

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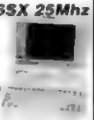

- 386SX 25MHz 4MB RAM
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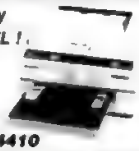

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15ms 3.5" HH
Bare Drive Kit **$649**
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16 Bit Kit **$199**

**60MB** ST277R-1 **RLL**
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Bare Drive Kit **$249**
8 Bit Kit **$299**
16 Bit Kit **$319**

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18ms 3.5" 1"H
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8 Bit Kit **$349**
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16ms 3.5" 1"H
Bare Drive Kit **$359**
16 Bit Kit **$379**

**210MB** ST1239A **IDE**
15ms 3.5" HH
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**1050MB** ST41200N **SCSI**
15ms 5.25" FH
Bare Drive Kit **$2099**
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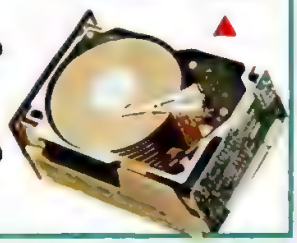

## Talon

**105MB** SA3101A **IDE**
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Bare Drive Kit **$329**
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**120MB** SA3062A **IDE**
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**513MB** M2624T **IDE**
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16 Bit Kit **$1395**

**1079MB** M2266SA **SCSI**
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**40MB** CP3000 **IDE**
25ms 3.5" 1"H
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8 Bit Kit **$219**
16 Bit Kit **$199**

**120MB** CP30104 **IDE**
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8 Bit Kit **$419**
16 Bit Kit **$399**

**209MB** CP3204 **IDE**
16ms 3.5" HH
Bare Drive Kit **$609**
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## Maxtor

**120MB** MX7120A **IDE**
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Bare Drive Kit **$389**
8 Bit Kit **$429**
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**210MB** MX213A **IDE**
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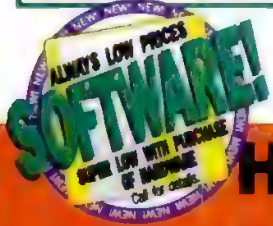

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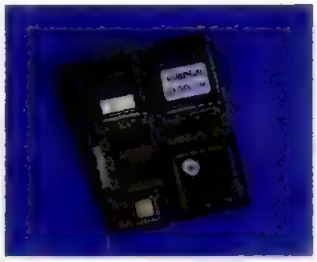

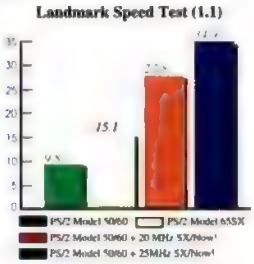


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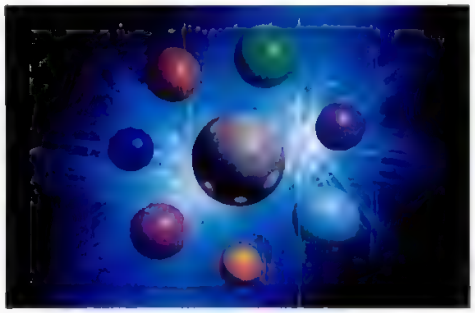

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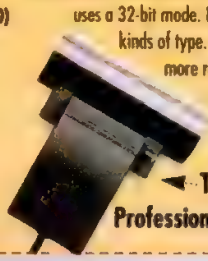

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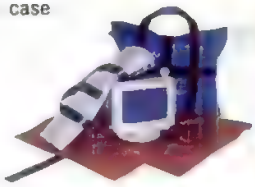

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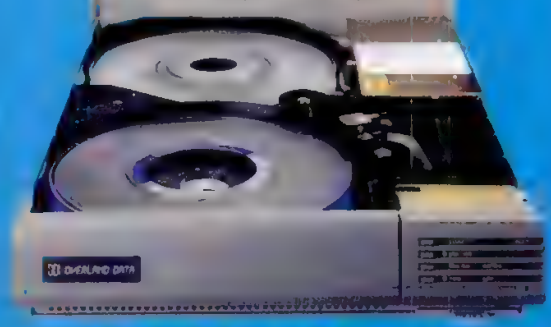

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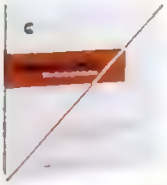

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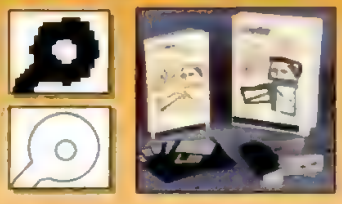

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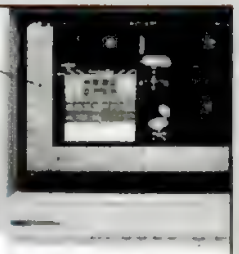

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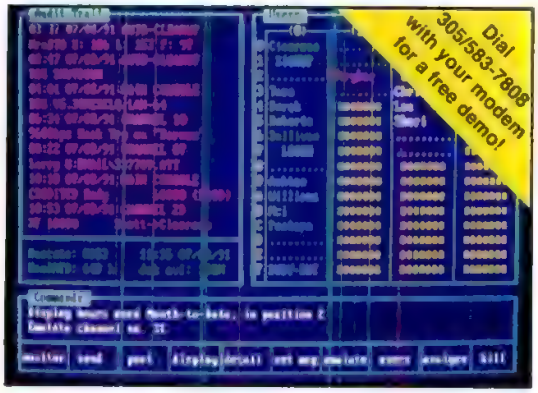


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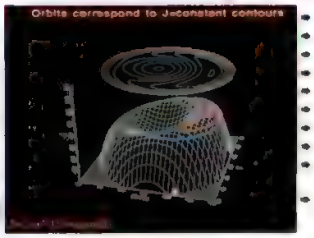


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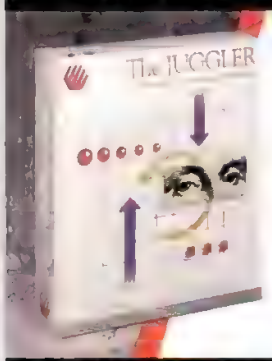


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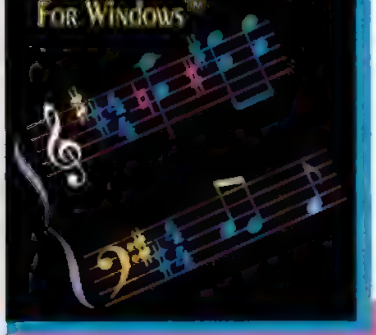

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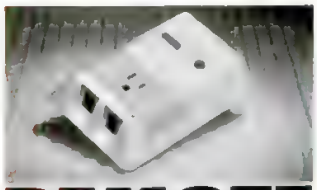

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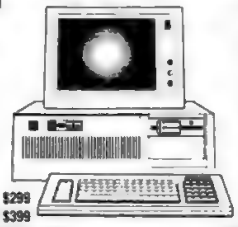

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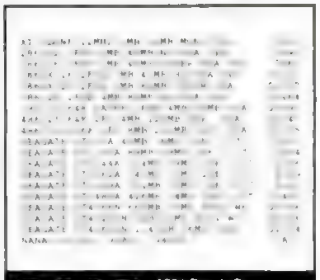

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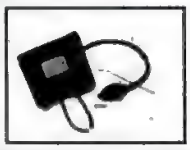

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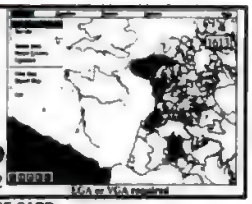

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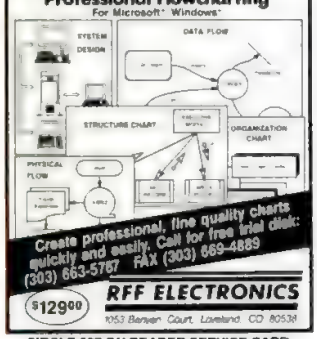


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Over 160 affordable applications for the PC and Mac. Dazzling color output. Ground water modeling, soil, water or mineral chemical analysis, contaminant fate, surface gridding & contouring, geophysical modeling, digitizing, fracture analysis, laser log plotting, & much more! FREE CATALOG!
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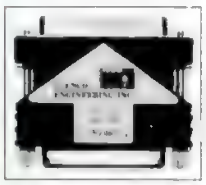
Wheat Ridge, CO 80033
(303) 423-5645 • FAX (303) 423-6171

## SECURITY

# STOP SOFTWARE PIRACY



**Hardlock**
Programmable, algorithmic response and memory option — all in one

Call for information on our disk-based systems.

### Developers Say...
"Since the Hardlock uses an algorithmic response chip, I am assured of the highest level of protection. Also, the optional programmable memory means I can keep custom configurations in Hardlock. I can protect my .EXE or .COM files directly and/or incorporate Glenco's high level language interface routines into my software."

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"Since our software can't be copied, our revenue has steadily increased. The unique programming board allows us to program the Hardlock in seconds. This ensures optimum delivery schedules from Glenco and a lower inventory cost for us. Hardlock's field programmable feature means a single Hardlock can protect more than one product."

### End Users Say...
"Hardlock allows me to backup my software investment. I just plugged Hardlock into the printer card, connected the printer cable, and forgot about it."

**GLENCO ENGINEERING INC.**
SERVING THE SOFTWARE INDUSTRY SINCE 1979
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Illinois 60089-6930
(708) 808-0300
FAX 808-0313
1-800-562-2543
CIRCLE 637 ON READER SERVICE CARD
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Since 1986, thousands of companies worldwide have chosen Az-Tech Software as partners in their fight against Software Pirates. Why? Because Az-Tech offers you:
***DATE & EXECUTION LIMITS* COMPRESSION**
***ENCRYPTION * SERIALIZATION* REMOTE RESET**
All of this and now our newest releases in both Hardware and Software based protection:

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- OPTION BOARD SAFE
- CPU LOCK
- REMOTE REGISTRATION
- CD ROM LOCK
- WINDOWS COMPATIBLE

with over 14 new features you have asked for over the years. If Software based protection is what you need, don't settle for anything less than EVERLOCK 3.0.

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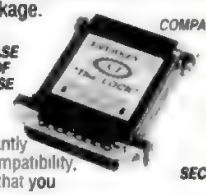
We have combined the Versatility of Az-Tech Software and the ONE WIRE Hardware Compatibility of Dallas Semiconductor in this new package.




These systems are easy to use and most importantly they work! No other product can provide the Compatibility, Flexibility, Ease of Use and Degree of Protection that you receive with Az-Tech products

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201 East Franklin, Suite 11 Richmond, MO 64085
(816) 776-2700 *LEADERS IN SOFTWARE SECURITY* FAX (816) 776-8398
CIRCLE 639 ON READER SERVICE CARD

**SOFTWARE COPY PROTECTION**
- Installs easily on your IBM-PC software
- Defeats all disk copy software
- Supports all Hard & Floppy disk formats
- Requires NO special devices or disks
- Invisible to your end user

Eval. disk protects 2 disks. . . . . $25
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Fort Lee, NJ 07024
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**BIT-LOCK® SECURITY**
Piracy SURVIVAL 8 YEARS proves effectiveness of powerful multilayered security. Rapid decryption algorithm. Device transparent to PARALLEL or SERIAL port. Complimented by low cost KEY-LOK™ multifeatured COMPU-LOCK™ Countdown, timeout, data encoding, multi-product protection, DOS/UNIX. Access control
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Littleton, CO 80122
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**BAR CODE & MAGNETIC STRIPE READERS**
**For PC/XT/AT, PS/2, and RS-232 Interface**
- Direct keyboard interface, no software change
- Reads UPC, EAN, Code 39, 11, 128, I 25, Codabar, MSI
- Direct from manufacturer, 30 day money back guarantee

Reader with plastic wand $280 with steel wand $350
with Magnetic Strip Scanner $380
Bar code labeling software from $50
Reserve discount available direct from manufacturer
IBS Intelligent Barcode Systems, Inc
2820 Pietro Dr.
Hacienda Heights, CA 91745
Tel (818) 968 6265
Fax (818) 968 5527

Classified Advertising Information
**(800) 825-4237**

To place your ad in
**PC MAGAZINE CLASSIFIED**
Call **(212) 503-5115** or **(800) 825-4237**

## BAR CODING

# BAR CODE HEADQUARTERS

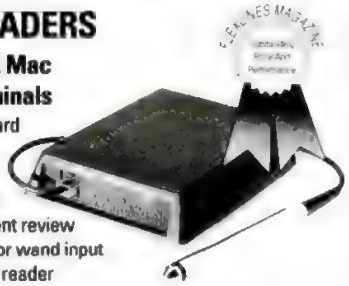
**Same Day Shipping!**
**Direct from manufacturer**
**30 day Money back guarantee!**
**2 year warranty on wand & reader**

## LABELING SOFTWARE

- For Epson, Oki, IBM, and LaserJet.
- Flexible design. Any Format or size.
- On-Screen Label Design, WYSIWYG.
- 16 text sizes — 3" reads at 100'
- Bar codes: 2of5, 128, UPC/EAN. AIAG, MIL-STD, ZIP+4, & Code 39
- Auto-incrementing. File input.
- Logos, symbols — from scanners.
- Reversals, color, soft fonts. Powerful, Versatile, Fast, Easy!
- Rotatable, shadable, scalable fonts from 1" to 13" on LaserJet III
- Above label printed with LabelRIGHT™ — **$279**
- Other menu driven programs from **$129**. SCO/UNIX — **$199**

## BAR CODE READERS

**for PC, XT, AT, PS/2, Mac and all RS-232 Terminals**



- Attaches as 2nd keyboard
- No software changes
- 2of5, UPC/EAN, 128, Codabar, MSI, Code 39
- Top rated by independent review
- Magstripe, laser, CCD, or wand input
- 1 or 2 input devices per reader
- 100 configurable options
- Complete with steel wand — **$399**

## PORTABLE READERS

- Battery operated reader. Simple, powerful!
- 64 or 256K memory
- Bar code or keyed input.
- Codabar, 2of5, UPC/EAN, 128, Code 39
- Easily programmable prompts.
- RS-232 or keyboard models
- Doubles as non-portable reader.
- Downloaded verification tables
- Programming is easier than BASIC
- Wand, CCD or laser input
- Complete 64K units with wand — **$799**

**WORTHINGTON**
DATA SOLUTIONS
417 Ingalls Street • Santa Cruz, CA 95060

**800-345-4220**
FAX 408-458-9964 • 408-458-9938

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## EZBarcode® Readers for PC, PS/2, Terminals

- Five year warranty — the best in the industry
- Free bar code printing utility included
- Installs in minutes — no drivers or software changes necessary
- Autodiscriminating reads all standard symbologies
- In stock, fast shipping
- 30 day money back guarantee

**$289** with rugged plastic wand

with stainless steel wand **$349**

track 1 mag stripe reader add **$100**

with laser scanner **$1385**

with 1" CCD scanner **$885**

RS-232 serial version add $30

Also available: Portable bar code readers and bar code printing software

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## ITS BAR CODE READERS

*MORE FEATURES MORE AFFORDABLE*

NEW IMPROVED

**Starting at $279 with wand!** • Transparent operation. • No software required • PC, XT, AT, Mac, PS2, others.

Look into our our full line of reliable, competitively priced readers, keyboard and serial wedges, portable data collectors, multi-drop readers, wands, laser scanners, mag stripe readers, and bar code printing software • OEM and reseller discounts. We provide solutions to systems! Custom application software for Data Collections available. Call for details.

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(714) 990-1880 • FAX (714) 990-2503
13 Welwyn Ct., Richmond, VA 23229
(804) 741-6725
CIRCLE 642 ON READER SERVICE CARD

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## BAR CODE READERS

There is a difference: *PRICE!*

Wand & Decoder **$179**

CCD & Decoder **$495**

Laser & Decoder **$995**

AGGRESSIVE PRICING! Reseller discounts
User software-transparent keyboard emulation wedges for PC's, clones, PS/2 and Macintosh
Bar code slotreaders magnetic stripe RS-232 versions Printing Software 30-day money back

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## Portable Bar Code Readers

TimeWand I — DuraWand — TimeWand II

Data collection just easy and effective. Videx portable bar code readers. Cordless, portable, non-purchase and lightweight! Now you can take the Wand to where the work needs to be done. Call Videx today for your free information kit: 503-758-0521.

Videx

TimeWand I ..... $248
DuraWand ..... $495
TimeWand II ..... $698

503-758-0521

CIRCLE 641 ON READER SERVICE CARD

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## Did you know...

PC Magazine Classified generated a whopping $200 million in annual sales revenue for its advertisers, resulting in these expenditures–

- Over $52 million in applications software
- Over $52 million in computer systems
- Over $22 million in supplies
- Over $12 million in systems
- Over $61 million in peripherals
- Over $500,000 in consulting services
- Over $8.9 million in other computer products and services

---

Calling about an ad?
Say you saw it in
**PC Magazine Classified**

# PC MAGAZINE CLASSIFIED

## BAR CODING

**BAR CODE READERS**
**AMERICAN MICROSYSTEMS**
2190 A Regal Pkwy. • Euless, Texas 76040 • (817) 571-9015

**FOR PC, XT, AT, PS/2 & TERMINALS:**

- No software changes required
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- Reads Code 39, I-2of5, UPC/EAN Codabar, 128, 93, 11, MSI/Plessey
- Auto-discriminates between codes
- Accepts WAND, SLOT, CCD, LASER, MAG STRIPE

DECODER BOX

MAG STRIPE

SLOT (BADGE)

WAND

LASER

CCD

**BAR CODE PRINTING SOFTWARE:**

- For Epson, OKI, IBM, Dot Matrix and HP LaserJet Printers.
- Prints Code 39, I-2of5, UPC/EAN, Codabar 128, 93, 11, MSI/Plessey
- Easy to use

**PORTABLE READERS:**

- Use as a portable, wedge or terminal
- Input Devices WAND, CCD, or 5V LASER
- Real-time clock for date and time stamps
- Automatic power off with resume
- "Built-in" program generator
- Multiple programs & data files
- "Built-in" inventory programs
- 54 key alpha/numeric keyboard
- Supports HAYES compatible modems

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30 Day Money Back Guarantee
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**BAR CODE PRINTING**

BEAR ROCK
MEANS BAR CODES
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- **Bear Rock Labeler™** - Windows labeling program with eleven bar code symbologies
- **PrintBar™** - Bar code font packages for the Macintosh
- **PrintBar II™** - DOS memory-resident bar code package for PCs
- **PrintBar SoftFonts™** - Soft font package for LaserJet printers
- **PLUS:** Source code, readers, scanners, and much more!

*For more information call*
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*Labeling & Barcoding Software*

- $259 – 9, 24 pin dot matrix
- $299 – HP & compatible lasers
- $459 – Thermal, matrix and laser
- WYSIWYG label design; easy to use
- *Includes* built-in data base
- *Includes* label batch printing
- *Includes* scalable font support
- *Includes* PCX image support
- Imports/exports data
- All popular bar codes including Postnet and Code 128
- Variable code densities, heights
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- Live, working demo – $12.95

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(419) 874 8502 • FAX (419) 874 9313

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- OUR NAME SAYS IT ALL •
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- Lowest Prices •
- Free Test Conversion •
- WordPerfect Training available •
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- PRINTER PORTS
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MANY MORE SPECIAL ITEMS
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ENTRUST THEM TO US
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or (312) 419-8771 FAX:(312) 419-1390

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**PC Magazine Classified**

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We transfer files between incompatible computers. Thousands of formats supported among dedicated word processors, DOS, DEC VAX, UNIX, XENIX, Apple and Macintosh

- **Cartridge tapes (incl. TK-50, TK-70)**
- **9-track tape (800 to 6250BPI)**
- **3.5", 5.25", 8" floppy disks and Syquest**

*For cost effective, quality conversions, call*
**Disk Interchange Service Co.**
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(508) 692-0050

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Capabilities include over 3000 formats

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(708) 459-6010

**CHANGING WORD PROCESSORS?**

Media transfer to or from
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*The Leader in Data Recovery Services*

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- Fast Turn Around
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Comdex #1459

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Classified Advertising Information **(800) 825-4237**

# PC MAGAZINE MARKETPLACE CLASSIFIED

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J. Alexander Clark & Associates
*Since 1984*

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- Over $52 million in applications software
- Over $52 million in computer systems
- Over $22 million in supplies
- Over $12 million in systems
- Over $61 million in peripherals
- Over $500,000 in consulting services
- Over $8.9 million in other computer products and services

## DISKETTE COPY SERVICES

**SOFTWARE DUPLICATION**

- One-Stop Shopping
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- Document Printing
- Custom Printing
- Custom Packaging
- Fulfillment
- Fast Turnaround

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FAX 908-462-5658

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DUPLICATE ANY FORMAT
- 5¼" and 3½" Diskettes
- Fast and Versatile
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- Stand-Alone or PC Based

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(512) 450-0801
Fax (512) 450-0869
VICTORY ENTERPRISES
Technology Inc

CIRCLE 650 ON READER SERVICE CARD

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- Competitive Pricing
- 24 Hour Turnaround
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MSDOS duplication from $ 59(5 25") and $ 86(3 5"). Prices go even lower as you continue to order!

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- Label and sleeve printing
- 48 hour turn around
- Fulfillment and drop shipment
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**800-243-1515**

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SAFEWARE
INSURES YOUR COMPUTERS

Full replacement of hardware, media purchased software. As low as $49 yearly. Covers fire, theft, power surges, other accidents. Blanket coverage, no list of equipment needed. Call for information or immediate coverage

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SAFEWARE, The Insurance Agency Inc
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CIRCLE 653 ON READER SERVICE CARD

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172 page guide to computer furniture, supplies and accessories
Dial Toll-Free
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GLOBAL COMPUTER SUPPLIES
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## SUPPLIES

24 HOUR TURNAROUND

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- 20% More Toner
- Replacement drums now available
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- We Buy Empties

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**$39.95**

SHIPPING INCLUDED

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Remanufactured Cartridges Starting at: $19

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Send empty cart. with wand.

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- IBM 4019 - 4 Colors!
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*MICR Toner & Fonts HP2, 3, 3Si*

Prices From **$45**

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CIRCLE 656 ON READER SERVICE CARD

# PC MAGAZINE MARKETPLACE BUSINESSCARD

*PC Magazine's BusinessCard section is a forum for innovative, hard-to-find and low-cost PC products and services. Ads are listed by product category and include Reader Service numbers to allow fast, easy response.*

**RATES:**
1 issue–$600, 3 issues–$550, 6 issues–$510, 12 issues–$480, 17 issues–$460, 22 issues–$450. Multiple-ad per issue rates also available. Prepayment must accompany each insertion. VISA/MC welcomed.

**AD FORMAT:**
PC Magazine will design and typeset each BusinessCard ad. Advertisers should furnish typewritten copy. Ads include: 1) Headline (1 line, initial caps–30 characters max, all caps–25 characters max), 2) Descriptive copy (5 lines, 225 characters max), 3) Company name (same specifications as headline), and 4) Address and telephone number (2 lines, 40 characters per line). No logos, artwork or camera-ready ads. Publisher reserves the right to edit supplied copy to meet section specifications.

**DEADLINES:**
PC Magazine is published 22 times a year, (bimonthly except for July and August). The BusinessCard closing is approximately two months prior to issue date.
Please send copy and payment to: PC Magazine BusinessCard, One Park Avenue, 3rd Floor, New York, NY 10016, ATT: Richard Wortman.
*For more information, call Richard Wortman at* 800-825-4237 *or* 212-503-5175, FAX: 212-503-5860.

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**TRANSPUTER EDUCATION KIT**
- PC add-in board with transputer & 1MB mem
- T400 C compiler and assembler
- T400 Occam2 compiler and debugger
- 1500 pages of documentation with schematics
- Read to use — only $396

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CIRCLE 801 ON READER SERVICE CARD

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CIRCLE 803 ON READER SERVICE CARD

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- Turn on with phone call - Use any remote software
- Auto turn off, 18s-39hrs after telephone session
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RIVERTON, NJ 08077-9687

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# PC MAGAZINE MARKETPLACE BUSINESSCARD

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PC MAGAZINE MARKETPLACE

**PC MAGAZINE MARKETPLACE**

One Park Avenue
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Production Director
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Production Coordinator
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Medford, MA 02155
(617) 393-3055

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**District Sales Manager**
Lisa Friedman
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Karen Keavey
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**Sr. Account Representative**
Stephanie Brzozowski
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**Account Representative**
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Chicago, IL 60606
(312) 346-7666

**District Sales Manager**
Jay Overbye
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**Account Representative**
Maureen Dooley
(212) 503-5126

**Sr. Account Representative**
Beth Boyle
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(214) 691-6934

**Account Representative**
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Irvine, CA 92715
(714) 852-8001

**District Sales Manager**
Robin Kofsky
(714) 852-8001

**Sr. Account Representative**
Molly Shank
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**District Sales Manager**
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Foster City, CA 94404
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**District Sales Representative**
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**Account Representative**
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**Production Supervisor**
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**PC MAGAZINE MARKETPLACE**
3rd Floor, One Park Avenue,
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# Coming Up

### ■ PLATFORMS GO HEAD TO HEAD

In this special feature, *PC Magazine* contrasts four major personal computing platforms: IBM-compatible, Macintosh, NeXT, and Sun computers. By evaluating the strengths and weaknesses of each platform—both its components and the software available—we help you choose the best machines for specific roles and show you how to connect them to an existing PC network.

### ■ PC-TO-MACINTOSH CONNECTIVITY

Just because PC users and Macintosh users sometimes can't communicate does not mean that their computers can't. Our connectivity team will present several approaches for combining PCs and Macs to create one big happy workplace. We'll cover all the angles for standalone machines and networks, from disk file transfer software to network operating systems, and supply a few helpful hints for getting the most from your hybrid system.

### ■ LABEL AND ENVELOPE PRINTERS

If you have ever tried to print labels and envelopes on a standard printer, you know that it can be frustrating. Label and envelope printers offer relief. They print single labels and envelopes or entire mailing lists; accompanying software lets you create and format addresses in the style you prefer. But are they really worthwhile? *PC Magazine* looks at four label printers and two envelope printers to see if you should think about making the investment.

### ■ LOW-END DESKTOP PUBLISHING

If you're not quite ready to dive headlong into the growing world of desktop publishing with a full-featured program like *Aldus PageMaker* or *Ventura Publisher*, but you're thinking of getting your feet wet, consider one of the five low-end packages reviewed in our next issue. But be aware of the trade-offs you'll have to make: Low-end packages are cheaper, but they may be more difficult to use. We'll tell you which packages best balance low price with high quality.

### ■ SMALL-BUSINESS ACCOUNTING

Entrepreneurs, small businesses on the rise, take note! *PC Magazine* brings you a Price Waterhouse report that looks at accounting software for nonaccountants. It's what you need to manage your General Ledger, Inventory, Accounts Receivable, and more—with ease! The products reviewed include *Access to Platinum, ACCPAC Simply Accounting, M.Y.O.B,* and *Peachtree Complete III,* among others. And look for a special appearance by Intuit's *QuickBooks*.

### ■ UTILITIES

Do you regularly download files from a BBS and find yourself waiting for the download to complete? If you would like to continue with your work instead of watching your download progress, BACKDOWN—the next issue's featured utility—is what you need. BACKDOWN is a TSR program that allows you to start and manage communications sessions and file downloads in the background while you continue working in the foreground. ■

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**System Requirements** • IBM PC/XT®, AT, PS/2 or other fully compatible computer • 640K RAM • DOS 3.1 or higher • CD-ROM drive with CD-ROM extensions for Microsoft® MS-DOS (Version 2.0 or higher).

# After Hours

*Products for the Leisure Side of Personal Computing*

## 386 Down the Power Alleys: Baseball Simulations Emerge from Spring Training

ENTERTAINMENT

Midnight nears, and the crowd, which sat detached while your team was shut out through eight innings of play, has erupted into a thunderous chant. Suddenly you realize: This is where your season begins.

It doesn't matter if you're a bookish purist calculating the success of Ted Williams versus a 1992 strike zone, or a beer-swilling bleacher creature waiting for the long ball. If you're a fan, one of these four games will be tailored just for you.

*APBA Major League Players Baseball, Bo Jackson Baseball, Tony La Russa's Ultimate Baseball,* and *Earl Weaver Baseball II* each have something different to offer, and all but *Bo Jackson* offer a slew of worthwhile companion programs and data disks. Unfortunately, at the time of this writing the new *USA Today* version of *Micro League Baseball,* promising digitzed film sequences, more player control, and access to *USA Today*'s statistical database, was not ready for review.

If you want an action game, none of these are as good as something you would find on Super Nintendo. Instead, these games play to the strengths of a PC, compiling player statistics and playing entire seasons in a short period of time. Except for spitting, fighting, and adjusting themselves, the ball players in these games act just like real major leaguers.

Despite all that these games have in common, each one fills a different niche. Which game is best for you depends solely on what you want to get out of the game.

### APBA Major League Players Baseball

In its basic form, Miller Associates' *APBA Major League Players Baseball* doesn't sport nearly the wealth of features the other games have. But if you want the most comprehensive game around, read on. With all its companion programs, *APBA* has no rival. It's the only game in this roundup that tests your skill against players from across the continent.

The instruction manual is thicker than the major-league rule book, but there are still features missing from *APBA*'s basic game. There are no graphics, and it doesn't accumulate stats, schedule seasons, or play games unassisted. You can't even manage against the PC.

Yet your strategy options are nearly as varied as in the other games. You can save lineups, draft teams, use relief pitchers, bunt, hit and run, adjust your defense, and more.

Because *APBA* has no graphics, the program describes the action for you, doling out the description like a colorful radio play-by-play announcer. This may sound like a drag, but wit and baseball lore pepper the drama. You'll experience player ejections, rain delays diminishing a pitcher's effectiveness, teams turning triple plays, and players colliding.

While *APBA* does not come with a fast mode that plays a season for you, play time can be as fast as a couple of minutes if you want it to be. Like *Earl Weaver, APBA* lets you store as many baseball leagues as you want, but the vendor also sells data disks for 40 different seasons plus five Old Timer's Teams—volumes more than any other game maker.

#### THE APBA LINEUP

*APBA* is for the serious fan, but to get the most out of it, be prepared to act like an owner and start forking over cash. When you finish a game, you can't tally stats unless you purchase *APBA StatMaster* ($39.95). *StatMaster* is not as straightforward as *Earl Weaver*'s *Commissioner's Disk,* but it tracks league leaders and lets you print.

***APBA Major League Players Baseball*** **offers such fine control that the games match what happens in the majors. Here is *next* fall's World Series: Boston versus Atlanta.**

■ ENTERTAINMENT
Four PC-based baseball competitors emerge from spring training for a new season.

*Hare Raising Havoc:* Help Roger Rabbit, that tormented 'toon, to find Baby Herman before Mom gets home.

The $39.95 *General Manager* lets you participate in fantasy baseball leagues with managers across the U.S. and Canada. At $40 per month, this expensive on-line service is a veritable training camp for would-be managers.

In league play, you don't actually manage your team head to head against other players. If you're the away team, you send instructions on how you want your team managed in different situations. The home manager follows your instructions.

On the other hand, a $49.95 companion program called *MicroManager,* soon to be compatible with *General Manager,* makes sending instructions obsolete because it records your managerial style. The home team's computer will download it automatically. *MicroManager* may also be used standalone to play against your PC.

*Baseball Wizard* ($39.95) lets you easily alter player abilities. As in *Earl Weaver,* the user types in the stats and *Wizard* sets the player ratings automatically. It's that simple.

In features, performance, complexity, and price, *APBA*

CONTINUES

## Baseball

CONTINUED

will be beyond the scope of many players; it's for the serious fan. But if you want to join a burgeoning interactive league, it's the best way to go.

When you purchase a product in the *APBA* family, you join one of the oldest baseball fraternities in America. Boys and grown men alike were playing APBA Baseball's card game long before Mickey Mantle made it to the big leagues. PCs and floppy disks have replaced APBA's cards and dice, and the game has lost some of its charm. But its statistical accuracy has not diminished, and neither has the excitement of playing it.

**List Price:** *APBA Major League Players Baseball,* 1992 Master Edition, $39.95; 1991 Data Disk, $19.95; other season disks, $24.95. *General Manager,* $39.95 plus on-line fees; *Baseball Wizard,* Version 2.0, $39.95; *MicroManager,* $49.95. **Requires:** 384K RAM, one floppy disk drive, DOS 2.1 or later. *General Manager* requires a modem. Miller Associates, 11 Burtis Ave., #200, New Canaan, CT 06840; 800-654-5472, 203-972-0777.

CIRCLE 479 ON READER SERVICE CARD

## Bo Jackson Baseball

Like the eponymous ballplayer, *Bo Jackson Baseball* promises to know and do it all. Touting itself as an action, strategy, and stats game, it does give you some things you want, like exquisite 3-D graphics, an easy interface, superfast league play, and statistical accumulation.

Like the real Bo Jackson, though, this simulation is a bit hobbled for serious fans. First, *Bo Jackson* does not have stats for any real players. You won't even find Bo on a roster. Second, the documentation is so concise that it fails to tell you how to play the game without the recommended joystick. The pregame interface is slow, the game ships just three fictitious ballparks, and you cannot manage a team without actually controlling the players.

Instead, *Bo Jackson* is an action arcade game that updates statistics. If you have a joystick, this game has the best action in the roundup. You have total control: You can make your fielders dive for balls and your base runners slide into second. When a ball is hit, a diamond icon indicates where it's going and the computer gives you control of the nearest player. You merely position the player and catch the ball.

Unlike the situation in other simulations, pitchers in *Bo Jackson* rely on your ability to place the pitch and curve it over the plate. To aim your throw, you watch a baseball that shuttles left and right behind home plate. When the ball gets to the location you want, you press a button on the joystick.

Managing your baseball team through an entire season is a breeze. After you set your pitching rotations and lineups, you can let your PC take over or play the games yourself.

**Relying on your skill as a pitcher to aim and curve the ball over the plate, *Bo Jackson Baseball* is configured to be the most complete action arcade game in this roundup.**

If you let *Bo Jackson* play for you, you just sit back and watch the scoreboards of all the teams. At its fastest, Bo plays an entire day's worth of games quicker than *Earl Weaver Baseball II* can play one—usually in under 30 seconds. The one minor inconvenience is that you can't leave the computer unattended. After each day, the computer asks if you want to continue.

Despite the things this game does right, something about it is still unfulfilling for the serious fan. It's cartoonish and lacks realism. You could program your favorite guys in, but that would be a chore. As for the ballparks, not one of them is real, and two of them are goofy. One resembles Mudville, while the domed stadium looks a golf ball stuck in a divot (and has grass growing indoors).

If you merely want an action game, get *Bo Jackson Baseball.* Except for the pitching, however, *Tony La Russa's Ultimate Baseball* is as good, and it represents real players and ballparks.

**List Price:** *Bo Jackson Baseball,* $49.95. **Requires:** 640K RAM, DOS 2.0 or later. Joystick and hard disk recommended. Data East USA Inc., 1850 Little Orchard St., San Jose, CA 95125; 408-286-7074 ext. 297.

CIRCLE 480 ON READER SERVICE CARD

# DUERK'S ENCYCLOPEDIA: The Baseball Bible Goes Electronic

**by Fredric Burke**

*The Baseball Encyclopedia,* from Macmillan Publishing Co., has long been the standard reference of those for whom baseball is the meat of conversation between April and October. Colby Duerk and Miller Associates have taken the same concept—and statistics provided by Stats Inc.—to create *Duerk's Electronic Baseball Encyclopedia,* a powerful tool whose scope will impress both fantasy-gaming fanatics and casual stat-hounds alike.

Now in its third season, *Duerk's* contains stats on every major leaguer who played in the 1989, 1990, or 1991 season, including playing time, positions, at-bats, and all the other tidbits that mark a career in "the bigs." The *1991 Career Disk* upgrade, for users who already have *Duerk's,* is $19.95; the complete 1991 version, which sells for $29.95, will be available around All-Star break time in July.

*Duerk's* is not just columns of numbers. It calculates not only seasonal stats but individual game performances, so users can see how a batter fared against a given pitcher.

Rotisserie and fantasy baseball gamers will appreciate the *Duerk's* Super Scout, a stats analyzer that lets you search for the best players. Super Scout ranks and selects players by the criteria that you set. Players are compared in adjoining windows, which display the skills you demonstrated, to permit line-by-line analysis of strengths and weaknesses—a great tool for building the best fantasy team you can.

Moving around inside *Duerk's Electronic* is a snap. Easily understood menus let you navigate within the encyclopedia with just a few keystrokes, or print out statistics for later.

*Duerk's Electronic Baseball Encyclopedia* is a boon to anyone who knows and loves baseball stats. It combines incredible flexibility with a wealth of statistical information. For creating your dream team or just following your favorite player, nothing beats it. ■

**List Price:** *Duerk's Electronic Baseball Encyclopedia,* $29.95; *1991 Career Disk,* $19.95. **Requires:** 512K RAM, DOS 2.1 or later. Miller Associates Inc., 11 Burtis Ave., New Canaan, CT 06840; 800-654-5472, 203-972-0777.

CIRCLE 483 ON READER SERVICE CARD

## Tony La Russa's Ultimate Baseball

*Tony La Russa's Ultimate Baseball,* from Strategic Simulations, is a beautifully animated game with a neatly manicured infield and lush, early summer green grass.

The basic game ships with one ballpark and 27 all-star teams from all the modern baseball cities. I also recommend the exquisitely detailed NL and AL stadium disks.

*Tony La Russa* lets you draft teams, tally stats, edit player abilities, or play against the computer. You can even let the computer play an entire season for you in a couple of hours. The only features noticeably missing are data disks for modern teams, modem and printer support, and the ability to store more than one league at a time.

As an action game, *Tony La Russa* nearly equals *Bo Jackson.* You choose from three levels of control, and picking your strategy is as easy as a keystroke. At the toughest level you must run, slide, throw, and plan strategy all at once. You even choose the way a batter swings. And if you have a joystick, fielding is a breeze. When a ball is hit, a large shadow forms in the area where it will land. As the ball approaches the ground, the shadow size diminishes. *Tony La Russa* puts you in control of the closest player, and if you can get him beneath the ball, he'll nab it.

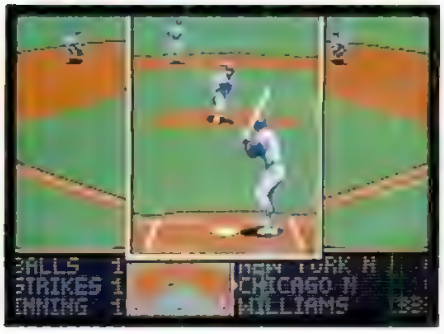
The game is fun and challenging to play, but something about it is claustrophobic. Your view of the stadium is limited, and you can't see to the top of the stands as you can in *Earl Weaver Baseball II.* When a batter clobbers one over Fenway's Green Monster, you can't really watch it; you only hear the crowd.

Also, the game stutters. The designers included a window in the middle of the screen that magnifies the pitcher and the batter. The window stays onscreen just long enough to give you an idea of where the ball has been hit. Then it disappears while the PC controls the game for the next few seconds. The pitch and swing are then repeated with you in control of the fielders. This doubled action gives you time to react but is unnatural and distracting.

*Tony La Russa* is an outstanding game. Its most unusual feature is its streak rating, which tells you whether a player is a quick beginner or plays his best down the stretch. It's quite realistic, and the ballpark graphics are beyond compare. But if it wants to beat *Earl Weaver* as the best all-around game, it's got to give you access to downloadable stats, let you print stats, and let you store more than one league at a time.

**List Price:** *Tony La Russa's Ultimate Baseball,* $49.95; *Great Teams 1901–68,* $19.95; *NL Stadiums* and *AL Stadiums* data disks, $19.95 each. **Requires:** 640K RAM, 4.7MB hard disk space, DOS 3.2 or later. Strategic Simulations Inc., 675 Almanor Ave., #201, Sunnyvale, CA 94086-2901; 408-737-6800.

CIRCLE 461 ON READER SERVICE CARD




**In *Tony La Russa's Ultimate Baseball,* you send wild pitchers off to the showers and call for relief from the bullpen. This game also features some of the best stadium graphics.**

## Earl Weaver Baseball II

From chats on the mound with your pitcher to second-base arguments with umpires, Electronic Arts' *Earl Weaver Baseball II* puts you in the front line of professional baseball like no other simulation. It is a must for managers who love statistics but who also relish seeing a hanging curveball crushed over the left-field wall.

**Although its stadiums are somewhat cruder than in the other games, *Earl Weaver Baseball II* is still the only game that gives you a view of the whole ballpark.**

*Earl Weaver* has been around for several years, and it is without question the most full-featured graphical game on the market. This does not mean that it is flawless, or that it's the right game for every user.

The basic game ships with nine all-star teams, including one from the Negro League. Each team has its own home field, a legendary park from yesteryear. The game also ships with modern stadiums that load automatically if you play with a modern home team. (For $19.95, you can buy current player stats and manager profiles for each team.)

Playing *Earl Weaver* is like watching a game on TV, except that the players listen to you. When a ball is hit to the outfield, the screen changes and you get a close-up of the play. All of this is orchestrated by the Director, which changes views as well as a professional TV producer when activated. But you may want to deactivate the feature at times; in Play and Manage mode it is something of an obstacle, preventing you from seeing your base runners.

The four levels of play offer a fine range of options. But it isn't the best action game, nor does it play an entire season the fastest. You have only limited control over the players, and even at the slowest level it's hard to tell balls from strikes.

*Earl Weaver* is at its best as a manager's game. You can compete against the PC or another user. Strategy menus allow you to select plays, set your defense, issue intentional walks, or change your lineups. At any point during a game, you can ask the program for advice. For example: It's the bottom of the ninth inning and you're two runs ahead, but your starting pitcher just issued a leadoff walk. The program may tell you to get someone up in the bullpen, hold the runner at first, and play the outfield deep. If you accept the advice, these strategies will be implemented automatically, saving you a trip to the strategy menu.

As with *APBA* and *Tony La Russa,* to get the most out of *Earl Weaver* you really should buy all the companion programs. The $29.95 stats-handling package, *Commissioner's Disk II,* excels as a stat compiler, but it also lets you schedule seasons, design your own ballparks, create your own managers, trade players, hire free agents, set up your own leagues, edit player skills, and download current stats from Stats Inc.

Although the game is much slower than *Bo Jackson* or *Tony La Russa,* you can leave the computer unattended and let it play an entire season for you. Or you can personally manage your team through a season while your PC handles the rest of the teams. *Earl Weaver* will even compile each player's statistics and save every box score.

For most baseball fans, this richly featured game will be the simulation of choice. Now if only someone can talk the vendor into dropping its annoying code-wheel copy protection!

**List Price:** *Earl Weaver Baseball II,* $49.95; *Commissioner's Disk II,* $29.95; *MLBPA Players Disk and Manager Profile,* $19.95. **Requires:** 512K RAM, 1.5MB hard disk space, DOS 2.11 or later. Copy protected. Electronic Arts, P.O. Box 7578, San Mateo, CA 94403; 800-245-4525, 415-572-2787.

CIRCLE 462 ON READER SERVICE CARD

# Roger Rabbit and the Case of the Missing Baby

ENTERTAINMENT
by Don Trivette

Like the filming sequence that opens the award-winning movie *Who Framed Roger Rabbit?*, *Hare Raising Havoc* begins with Baby Herman left in Roger's care. Baby disappears, and the babysitter must find him.

The challenge of this interactive cartoon from Disney Software is figuring out how to spring Roger from the series of seven scenes he must cross before finding Baby Herman in the Tasty-Moo Dairy. The more familiar you are with the impossible antics of cartoon characters, the easier this problem is to solve.

Take the second room, the kitchen. The door is locked, and there's no apparent way out. But wait: There's an ancient washing-machine wringer by the door—and a stack of dishes in the sink—and a hot stove—and a swinging light above. If you could find some way to jump to the stack of dishes, from there to the hot stove, and then to the swinging light, and finally to be squeezed paper-thin by the wringer, then you just might be able to slide under the door.

After the kitchen, a bathroom, backyard, street, and construction site must be negotiated in similar fashion before you can reach the dairy. You have 60 'toon minutes to complete the game. If you are lucky, you'll pick up some extra time and perhaps a little encouragement from Roger's wife—the impossibly well-built Jessica.

Production values are superb, as well they should be for a game with 342 files that reside in 5.25MB on your hard disk. Much of that is devoted to animation, sound effects, music, and the voices of Roger, Jessica, and Baby Herman. Cheers for the folks at Disney, who for the first time are supporting the Sound Blaster card as well as their own Sound Source hardware.

A mixture of slapstick comedy, Rube Goldberg action, and Disney animation make *Hare Raising Havoc* a new experience for jaded computer gamesters. Roger says 'toons are supposed to make you laugh; this new Disney interactive cartoon surely will. ■

**List Price:** *Hare Raising Havoc*, $49.95. **Requires:** 10-MHz or faster PC, 640K RAM, hard disk, CGA display or better, DOS 3.0 or later. Disney Software Inc., 500 S. Buena Vista St., Burbank, CA 91521; 800-688-1520, 818-841-3326.

CIRCLE 484 ON READER SERVICE CARD

**In Disney's *Hare Raising Havoc*, you have to help Roger (now stuck in the kitchen) to find Baby Herman. Your success depends on your knowledge of how 'toons think and act.**

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CIRCLE 158 ON READER SERVICE CARD

by Bill Howard

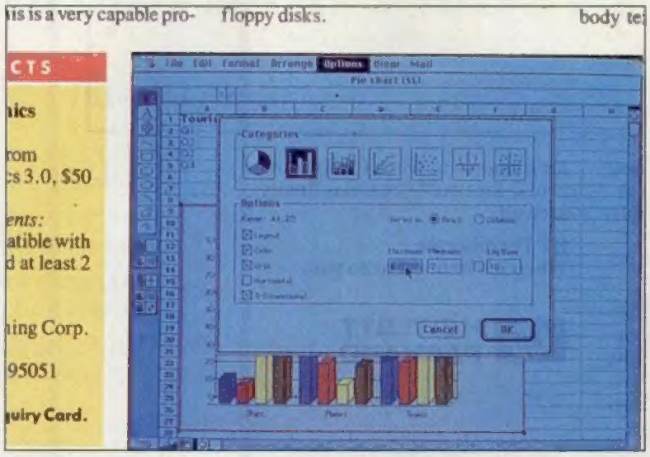
# Abort, Retry, Fail?

*The Lighter Side of Personal Computing*

### *The First AMD-Intel Joint-Venture Microprocessor*

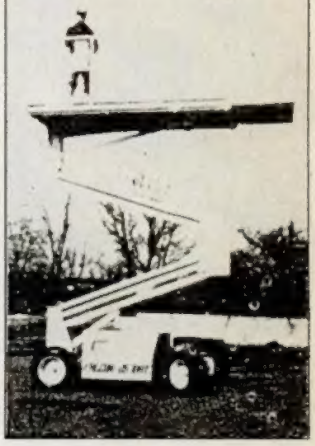
"AST Research (Irvine, Calif.) has announced what it claims is the first 25 megahertz Intel 80386SX-based notebook computer. The new notebook is based on Advanced Micro Devices' AM386SXL-25 central processing unit (CPU), AST said."

***—Bay Area Computer Currents,* September 1991**




***Byte*'s December 1991 screen photo of the new *Harvard Graphics for Windows* looks suspiciously Apple-like.**

### Computer Filing Cabinets

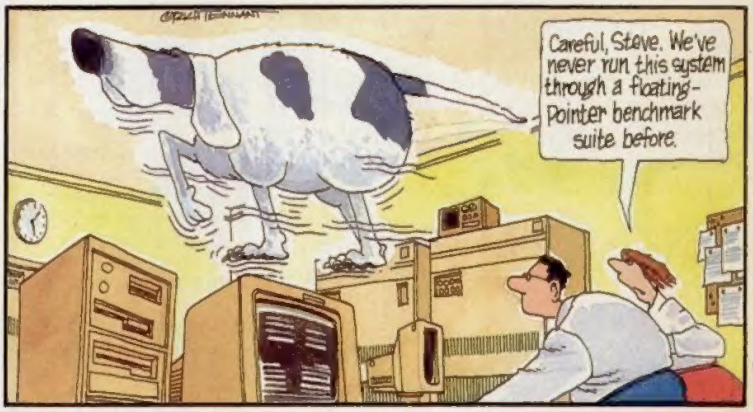


**It was expensive, but now short people have a way to reach the top drawer of their computer filing cabinets. (*Government Purchasing Guide,* October 1991.)**

Sales are vastly surpassing original projections," said Scott Cook, co-founder and president of Intuit. "There continues to be a shortage of Quicken for Widows at retail, as orders still exceed our ability to manufactu

**But *Quicken for Widowers*—that we have: Intuit Corp. press release**

**If ITT Educational Services teaches you to hold a mouse like that, maybe her family shouldn't rest easy.**

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**Maybe by spring semester they'll have the grammar- and spell-checker lesson ready to go. (*Gulf News,* April 1, 1991.)**

If your entry is used in Abort, Retry, Fail? we'll send you $50 and a *PC Magazine* T-shirt. Caution: In case of multiple entries, the postmark date, neatness, and completeness of each entry are considered. Winners this issue: Joel M. Rubin (Intel/AMD 80386SX-based notebook), Herman Lukito (*Harvard Graphics* on the Macintosh), Daniel Rosenbaum (*Quicken for Widows*), Rob Thorburn (computer filing cabinets), P.S. Seshadri (world processing), Philip Stripling (airborne mouse).

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